

Final Technical Report

AD-A204 735

# **TWO-SPEED EPICYCLIC FINAL DRIVES FOR A 14-TON AMPHIBIOUS VEHICLE**

**Development Progress During the Period from  
12 September 1983 through 18 January 1985**

**Prepared under Contract No. N00167-83-C-0110**

**Prepared for the**

**DAVID TAYLOR  
NAVAL SHIP RESEARCH  
AND  
DEVELOPMENT CENTER**

**Mark Rice  
Contracting Officer's  
Technical Representative**

**by**

**FMC Corporation  
Ordnance Division Engineering  
San Jose, California 95108  
Technical Report No. 4089**

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FINAL TECHNICAL REPORT  
TWO-SPEED EPICYCLIC FINAL DRIVES  
FOR A 14 TON AMPHIBIOUS VEHICLE

Development Progress during the Period from  
12 September 1983 through 18 January 1985

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Prepared for the  
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Mark Rice  
Contracting Officer's Technical Representative

by

FMC CORPORATION  
ORDNANCE DIVISION ENGINEERING  
SAN JOSE, CALIFORNIA 95108

REPORT NO. 4089

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FINAL TECHNICAL REPORT  
TWO-SPEED EPICYCLIC FINAL DRIVES  
FOR A 14 TON AMPHIBIOUS VEHICLE

ABSTRACT

This report summarizes the work performed to provide four two speed, power shift, epicyclic final drives with integral parking and emergency brakes for use on variable displacement hydrostatic and electric drive trains for 14 ton amphibious vehicles.

The basic design was completed prior to the award of contract N00167-83-C-0110. The effort under contract included detail drawings, fabrication, assembly acceptance testing, and delivery of hardware.

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FINAL TECHNICAL REPORT  
TWO-SPEED EPICYCLIC FINAL DRIVES  
FOR A 14 TON AMPHIBIOUS VEHICLE

1. INTRODUCTION

FMC Corporation under contract No. N00167-83-C-0110 with the David Taylor Naval Ship Research and Development Center was awarded a contract to provide four two-speed, epicyclic final drives for a 14 ton, Marine Corps amphibian vehicle and related technical data.

The basic design for the final drive was defined by FMC prior to contract. The scope of work to be accomplished under this contract was the detailing phase, fabrication, acceptance testing and delivery of four final drives. Contract amendments P00007 and P00009 added additional work. P00007 required the addition of hardware to accept a magnetic pickup for measuring output speed. P00009 required the measurement of clutch engagement/disengagement times and the disassembly inspection of S/N 3 final drive. Results of this effort were covered in a letter report to DTNSRDC (copy in Appendix 2).

Additional reports provided DTNSRDC under this contract were the Interim Technical Report FMC No. 3982 for progress during the period from 12 September 1983 through 12 December 1983 and the monthly reports 1 through 13.

2. DISCUSSION

The FMC design for the two-speed epicyclic final drive was based upon DTNSRDC RFP N00167-83-R-0024. The tabulation below compares the RFP requirements and FMC's design specifications.

<u>Input</u>	<u>RFP Requirements</u>	<u>FMC Design Specifications</u>
Max Torque	966 ft-lbs	966 ft-lbs
Max Speed	3500 RPM	3500 RPM
Max Horsepower (Continuous)	125	125

<u>Output</u>	<u>RFP Requirements</u>	<u>FMC Design Specifications</u>
Max Torque	10,000 ft-lbs	10,000 ft-lbs
Max Speed	788 RPM	788 RPM
Max Horsepower (Intermittent)	450	450

<u>Efficiency</u> (Gear Box)		(Gear Box and brakes)
Min Low Gear	94%	Varies with speed and horsepower.
Min High Gear	96%	Varies with speed and horsepower. See figures 9 and 10.

<u>Ratios</u>		
High Gear (Reduction)	4.44:1% $\pm$ 2%	4.4800:1
Low Gear (Reduction)	10.35:1% $\pm$ 2%	10.4763:1

<u>Brakes</u> (14 ton vehicle)	Stop at 5 MPH on 60% slope.	Stop at 5 MPH on 60% slope. Emergency Stop at 45 MPH one time with tracks locked. Parking on 60% slope.
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Rotation

Fully bi-direct-  
ional Interchange  
able between  
vehicle sides.

Fully bi-direc-  
tional Inter-  
changeable be-  
tween vehicle sides.

Weight and Volume

Max Weight

260 lbs

304 lbs (w/integral  
brakes)

Max Volume

3000 cu.in.

2374 cu.in.

Lubrication

Oil

RFP  
Requirements

Mil-L-9250

FMC Design  
Specifications

Mil-L-9250

or

Mil-L-2104

Lifecycle

Design life

2000 hrs

2000 hrs

Overhaul time

(Minimum)

1000 hrs

1000 hrs

Ambient Temperature

(Operating Range)

-20°F to +180°F

-20°F to +180°F

The curves identified below show the requirements over the entire range of operation.

Fig. 1 - Gearbox input speed vs Vehicle speed

Fig. 2 - Motor horsepower vs Output speed

Fig. 3 - Motor Torque vs Output speed

Fig. 4 - Input Shaft RPM vs Output shaft RPM

This report covers the technical, fabrication and test effort performed to completion of four two-speed final drives under contract N00167-83-C-0110 including all modifications through P00010 to the contract.

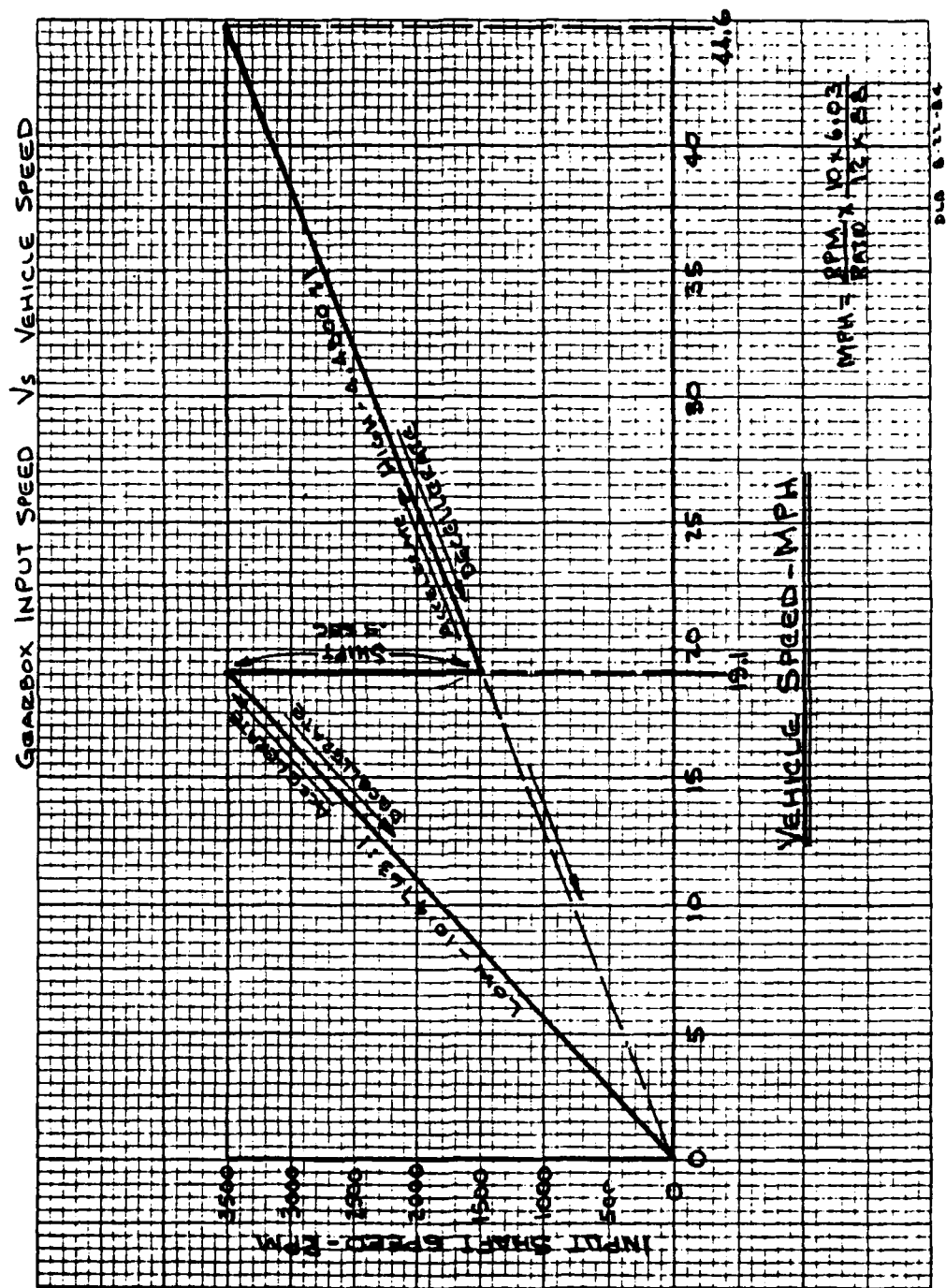


FIGURE 1

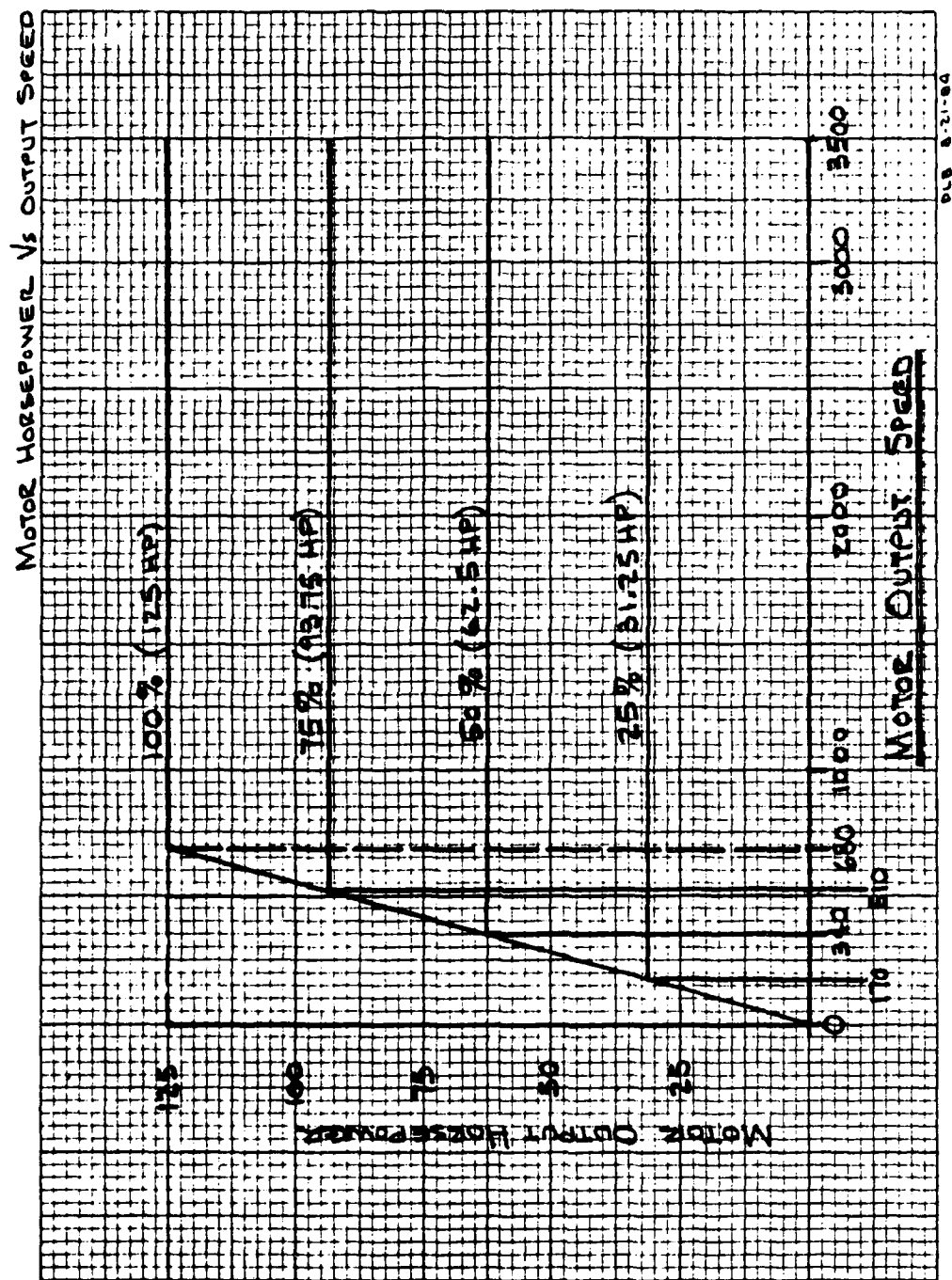


FIGURE 2

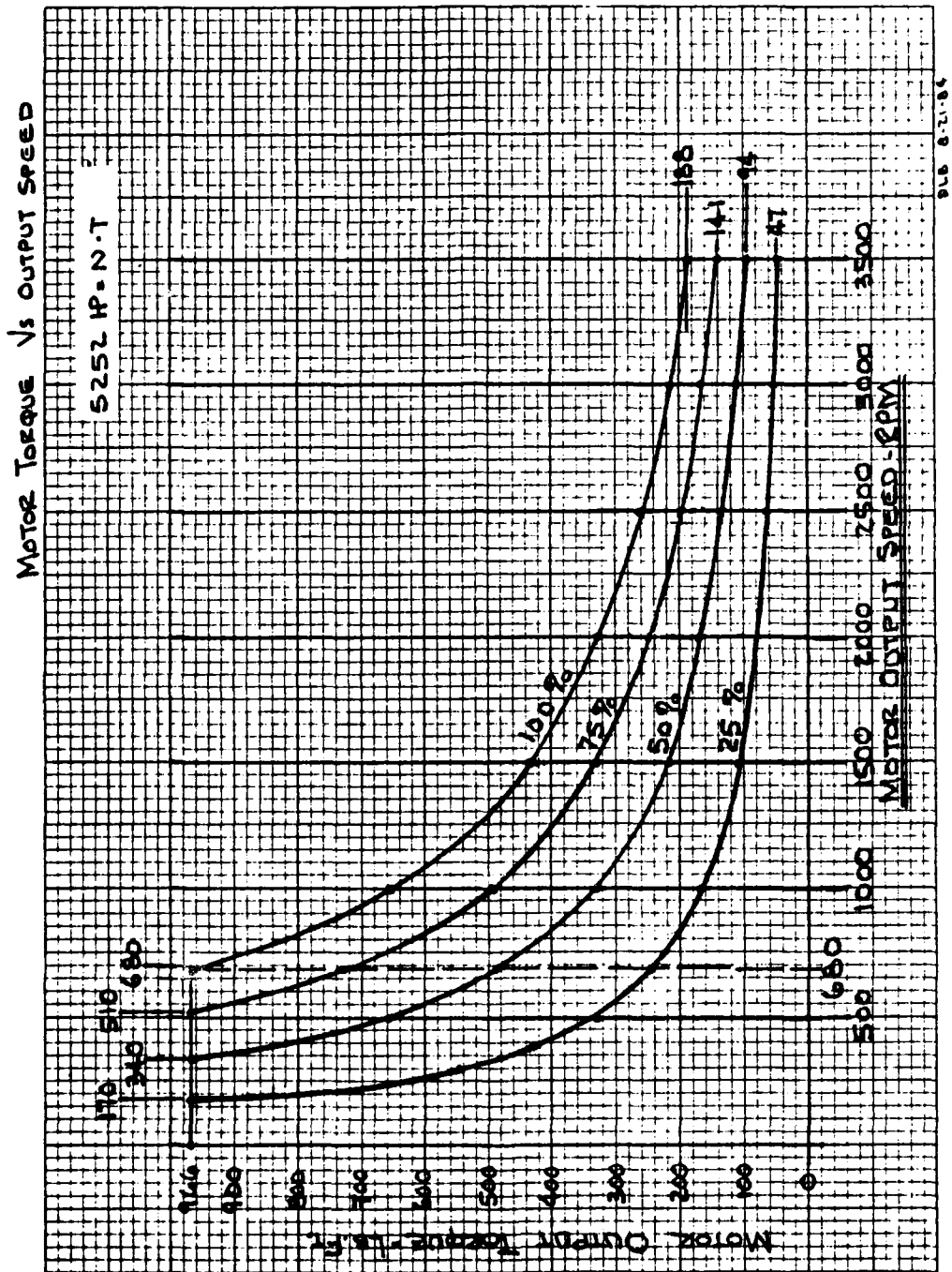


FIGURE 3



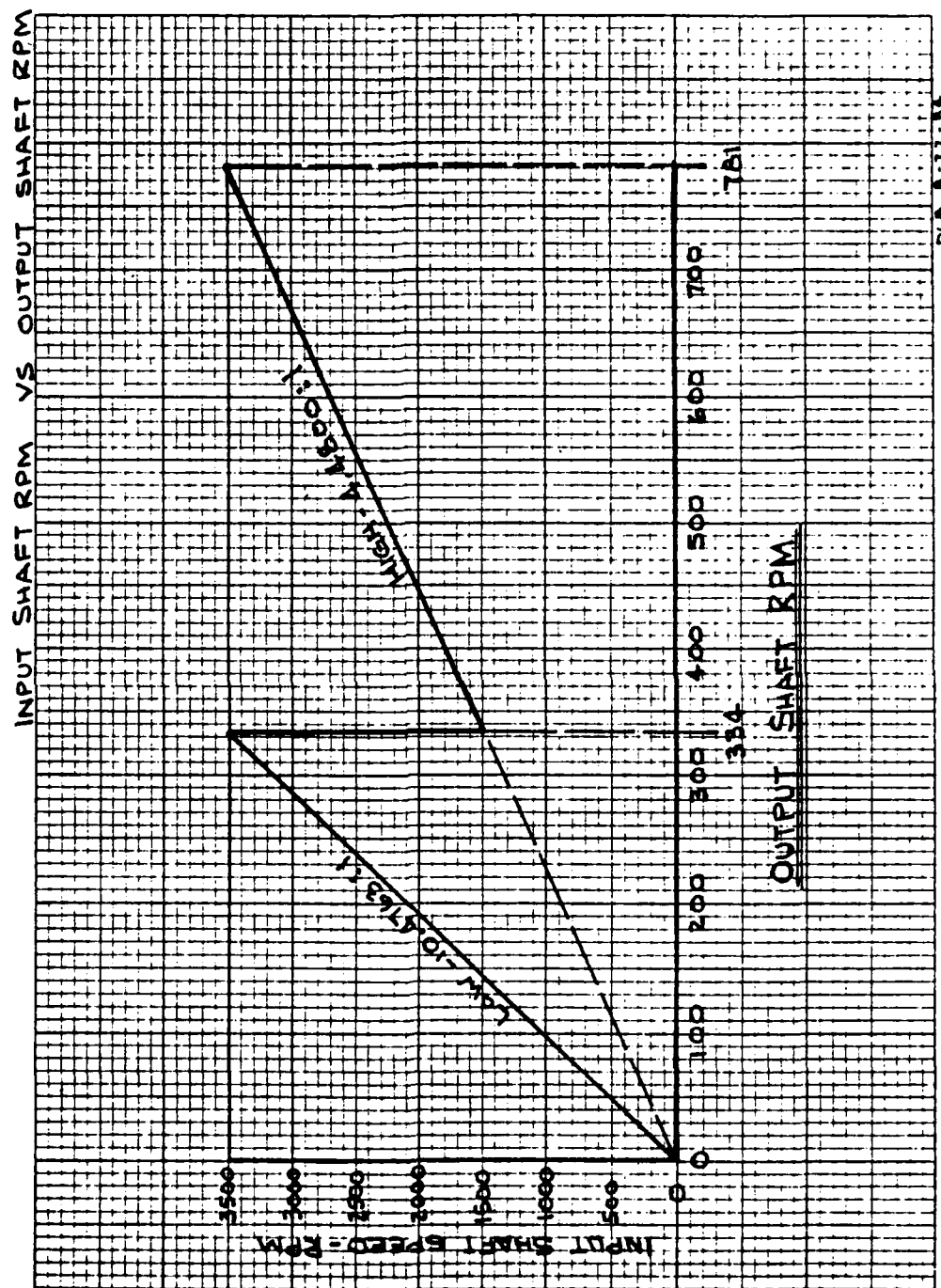


FIGURE 4

Additional reports provided DTNSRDC under this contract were the Interim Technical Report FMC No. 3982 for progress during the period from 12 September 1983 through 12 December 1983 and the monthly reports 1 through 13.

The Interim Technical Report discusses design changes made from the original proposal including Amendment P00004. Since that report, two major amendments were added to the contract. They were:

- o Amendment P00007 for the design of a toothed surface and the addition of a threaded boss to accept a magnetic pickup for measuring output speed.
- o Amendment P00009 increased the test effort by including the measurement of clutch engagement/disengagement times and disassembly/inspection of the third final drive scheduled to be done after completion of the acceptance test. Results of this effort were covered in a letter report to DTNSRDC (Copy in Appendix 2).

The monthly reports defined the accomplishments, problems, significant results, work planned for next report period, and man hours and funds expended for each report period.

## 2.1 Design

During the design phase prior to award of contract and after the FMC proposal was submitted several parts had to be made from steel instead of aluminum due to stress levels. This, combined with the addition of the request of Amendment P00007 for the magnetic pickup capability, increased the final drive weight from the estimated 246 pounds to an average of 304 pounds for the four units. The estimated volume of 2374 cu. in. was maintained in the final configuration.

Disassembly and inspection of final drive S/N 3, task 2, per Amendment P00009, revealed a lubrication problem at the outer bearing of the input

bevel gear. A modification was made to the input bevel gear shaft and the shaft bearing retainer to resolve the problem. This modification was added to final drive S/N 4 prior to acceptance testing which proved that the problem was eliminated. All four units have this modification incorporated. Letter Report covering the results of amendment P00009 explains in more detail, including photographs showing the bearing discoloration and the parts modifications. Copy in Appendix section 2.

Acceptance testing of the four final drives resulted in changes to the calculated oil pressures and flows in certain areas of the final drive system. The revised required oil pressures and flows are tabulated below and are verified in the acceptance test reports.

High Range Clutch Apply Pressure	225 $\pm$ 25 PSI
High Range Clutch Continuous Oil Flow	3.3 to 3.8 GPM
High Range Clutch during Engagement Oil Flow (min)	18 GPM
Low Range Clutch Apply Pressure	225 $\pm$ 25 PSI
Low Range Clutch Continuous Oil Flow	1.3 to 1.5 GPM
Low Range Clutch during Engagement Oil Flow (min)	4 GPM
Brake Disengagement Pressure	275 $\pm$ 25 PSI
Brake Continuous Oil Flow	0.7 to 1.0 GPM

High range is defined as low ratio, high vehicle speed  
Low range is defined as high ratio, low vehicle speed

A pressure control valve was designed into the output bevel gear shaft to insure the first stage clutch cavity will remain full for fast operation, but will not engage due to pressure caused by high speed centrifugal effect on the oil. A flow control valve combined with orifices which provides the required oil flow and retains oil at all rotational speeds in the shaft cavity was also designed into the same bevel gear shaft. Both of these valves were bench tested to validate their proper operation and for sizing of the orifices. Clutch continuous oil flow shown above includes gear box lubricating oil.

Efficiency of the two-speed final drive was calculated using test data oil flows and inlet and outlet temperatures. The curves in figures 9 and 10 show the average efficiencies over the operating range of the final drives.

Static brake tests were accomplished on all four final drives. Torque was measured on the output shaft with the results tabulated below.

<u>Torque Required</u> <u>(Hold 14 Ton Veh-60% Slope)</u>	<u>Measure Output Torque</u> <u>(Maximum)</u>	<u>Final Drive</u> <u>(S/N)</u>
5500 ft-lbs	8000 ft-lbs (No Slip)	1
"	8000 ft-lbs (No Slip)	2
* "	7166 ft-lbs (Slipped)	3
"	8000 ft-lbs (No Slip)	4

\*During the disassembly inspection of final drive S/N 3, it was noted that the brake plates showed signs of overheating and wear from lack of lubrication. During testing of the final drive the lubrication supply dropped below the minimum design requirements of .7 GPM leading to damage of the plates. Final drives S/N 1, 2 and 4 showed no signs of damage.

Dynamic brake tests were run on final drive S/N 4 with the dynamometer disconnected. The time required to stop was .48 seconds with an output speed and torque of 100 RPM and 160 ft-lbs. See strip charts figures 11 and 12.

Dynamic clutch tests were performed on final drive S/N 1, to verify that the design pressure of 225 PSI was adequate. The test was accomplished by reducing the apply pressure until the clutch slipped. The results are shown below.

<u>Range</u>	<u>Output Speed</u> <u>(RPM)</u>	<u>Output Torque</u> <u>(ft-lbs)</u>	<u>Output Torque</u>	<u>Clutch</u>	<u>Comments</u>
			<u>Pro-Rated 225 PSI</u> <u>(ft-lbs)</u>	<u>Pressure</u> <u>(PSIG)</u>	
High	31	3800	6,333	130-140	No Slip
High	32	3930	7,218	120-125	Slipped
Low	99	6735	10,450	145	No Slip

## Dynamic Clutch Test Results (Continued)

	Output Speed	Output Torque	Output Torque Pro-Rated 225 PSI	Clutch Pressure	
Range	(RPM)	(ft-lbs)	(ft-lbs)	(PSIG)	Comments
Low	130	6845	12,572	120-125	Slipped
Low	130	6850	12,581	120-125	Slipped

Maximum output torque of final drive based on maximum input torque of 966 ft-lbs to the motor (neglecting motor efficiency).

- o High Range 4,327 ft-lbs
- o Low Range 10,116 ft-lbs

## 2.2 Fabrication

The major problem encountered during fabrication was meeting the delivery schedule. This was due mainly to increase in lead time for deliveries quoted by gear, foundry, and clutch vendors between the proposal phase and the actual release of hardware.

The two housing castings first piece samples did not meet FMC dimensional requirements due to core shifts. This required rework of the patterns and repour of the castings which caused a delay in schedule.

Late delivery of the first stage clutch assemblies also caused a delay in schedule. This delay was caused by late delivery to the clutch vendor of the special sun gear/reaction plate forgings.

Except for the casting core shifts problem only two parts had to be rejected for being out of drawing specification and could not be reworked. These parts, however, were replaced without affecting schedule.

### 2.3 Acceptance Test

The first two final drives were tested for 20 hours with shifting being done in a static condition. Considerable time was spent trying to develop a method for shifting under load by manual control. The major problem was simultaneous control of both the hydrostatic pump servo and the dynamometer to synchronize shifting. During testing of the second two units, two power sources were used for controlling the hydrostatic pump servo, which allowed limited shifting under loads. This is discussed in more detail including strip charts, in the test reports in the appendix section 4 final drive S/N 3 and 4.

The functional 20 hour test cycle for the four two-speed final drives is tabulated below. The test plan outlining the requirements is included in the appendix section 3.

Percentage of Rated Power	Rated Power HP	Hours		Output Speed, Output Torque	
		Fwd.	Rev.	RPM	lb-ft
0	0	2.5	2.5	100 to 790	No Load
25 $\pm$ 2%	29 - 34	3.5	3.5	100 to 790	210 to 1640
50 $\pm$ 2%	60 - 65	2.5	2.5	100 to 790	420 to 3280
75 $\pm$ 2%	91 - 96	1.0	1.0	100 to 790	630 to 4920
100 $\pm$ 2%	123 - 128	.5	.5	100 to 790	840 to 6560

Oil samples taken every 5 hours of test.

Additional testing was requested in Amendment P00009 to measure clutch engagement/disengagement times. The requirements for both engagement/disengagement are tabulated below.

<u>Clutch Range</u>	<u>Differential Plate Speed</u>	<u>Output Torque</u>	<u>Output Speed</u>
High	100 RPM $\pm$ 50	200 ft-lbs	200 RPM
High	100 RPM $\pm$ 50	500 ft-lbs	200 RPM
High	100 RPM $\pm$ 50	1000 ft-lbs	200 RPM
Low	100 RPM $\pm$ 50	200 ft-lbs	200 RPM
Low	100 RPM $\pm$ 50	500 ft-lbs	200 RPM
Low	100 RPM $\pm$ 50	1000 ft-lbs	200 RPM

FMC performed these tests as defined per the modification with the following exceptions.

- o The minimum output torque obtainable with our system is 300 ft-lbs.
- o The differential plate speed attained was in the 50 to 250 RPM range.

Results of these additional tests were covered in a letter report to DTNSRDC and are included in the appendix section 2.

The hydraulic pump and motor used for the test caused considerable delay due to the pump being supplied with the wrong servo and a missing motor hot oil shuttle valve orifice.

### 3.0 SUMMARY

This report summarizes the work performed by FMC Corporation under contract No. N00167-83-C-0110 to provide four two-speed epicyclic final drives for a 14-ton Marine Corps amphibian vehicle.

- o Accomplishments, problem areas, and additional contract amendment tasks in the areas of design, fabrication, and test.
- o Operational system speeds, torques, and horsepower.

- o Assembly drawing 4212050, which includes a complete parts list.
- o Schematic of final drive.
- o Dimensional envelope drawing reflecting final configuration.
- o Interface dimensions - input, output, mounting bolt patterns, input spline, and lubrication ports.
- o Lubrication requirements.
- o Brake capabilities.
- o Clutch operation.
- o Acceptance test reports.

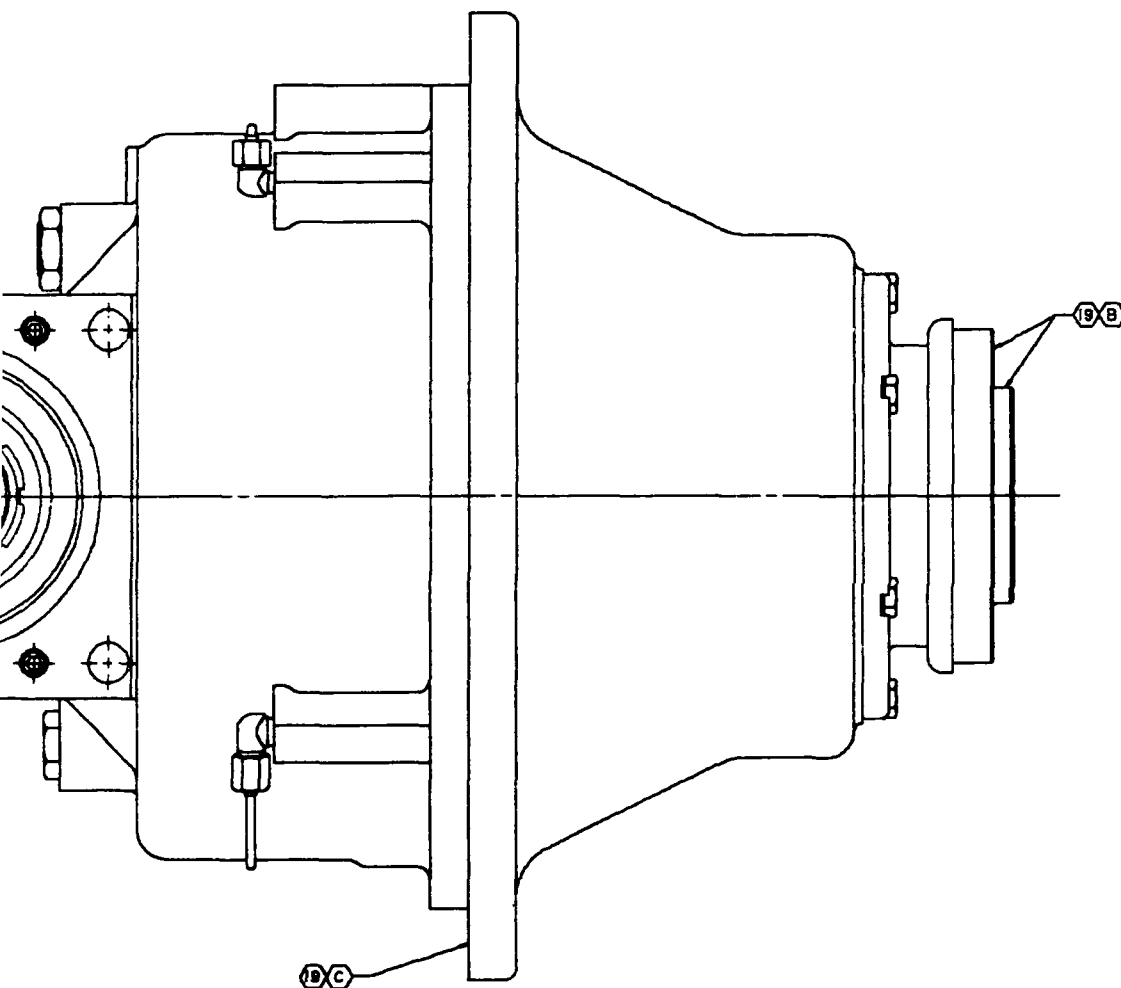
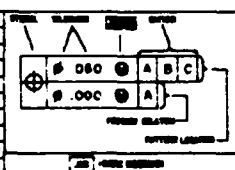


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	<p>NOTES:</p> <p>1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY THE/OD FORM 3 DRAWING REQUIREMENTS MANUAL.</p>			
H	<p>(2) BEVEL GEAR MOUNTING DISTANCE ADJUSTMENT: SHIM AT "V" TO SET TRUE MOUNTING DISTANCE. DIMENSION "Y" = <math>W+X-Z</math>. DIMENSION "W" IS MARKED ON HOUSING; ITEM 11. DIMENSION "X" IS MARKED ON GEAR; ITEM 02. MEASURE GEAR SHAFT DIMENSION "Z"; ITEM 02.</p>			
G	<p>(3) SHIM AT "U" TO SET NORMAL BACKLASH OF .005 TO .007 BETWEEN THE BEVEL GEARS. (EQUIVALENT TO A ROTATIONAL MOVEMENT OF .0074 TO .0104 AT 3.000 INCH RADIUS OR AN AXIAL DISPLACEMENT OF .0059 TO .0083 OF THE GEAR)</p>			
	<p>(4) ADJUST LOCKNUT TO GIVE BEARINGS 10-20 IN LB OF ROLLING TORQUE</p>			
	<p>(5) SHIM TO REMOVE ALL CLEARANCE BETWEEN BEARING CUPS AND SPACER</p>			
	<p>(6) ALIGN MARK ON BEVEL GEAR SHAFTS IN A PARALLEL MANNER TO TIME BEVEL GEAR TEETH.</p>			
F	<p>7. ALL OIL PASSAGES TO BE FREE FROM FOREIGN MATTER</p>			
	<p>(8) LUBRICATE PREFORMED PACKING PRIOR TO ASSY</p>			
	<p>(9) CLEAN PER METHOD C-1, SPEC MIL-P-116. APPLY SEALING COMPOUND, TYPE II OR III, SPEC MIL-S-45180 TO OUTER CIRCUMFERENCE OF SEAL</p>			
E	<p>(10) CLEAN PER PROCESS C-1, SPEC MIL-P-116 AND APPLY PIPE SEALANT WITH TEFLON (PST) 12297553 TO TAPERED MALE THREADS.</p>			
	<p>(11) APPLY PRIMER GRADE N OR T, FORM R, TO MALE THD. AND COAT MALE THD WITH COMPOUND GRADE A OR AA, SPEC MIL-S-22473</p>			
D	<p>(12) CLEAN ALL THREADS AND LUBRICATE WITH OIL PER MIL-L-2104, GRADE OPT, PRIOR TO ASSY</p>			
	<p>SCREW (BOLT) TORQUE REQUIREMENTS. (NOTE: ALL FASTENERS ARE GRADE 8)</p> <p>#10-32UNC = 49-53 IN-LBS .375-16 UNC = 36-38 FT LB .3125-18 UNC = 20-22 FT LB .250-28 UNF = 11-12 FT LB (132-144 IN.LB.) .250-20UNC = 10-11 FT-LB (120-132 IN.LB.)</p>			
	<p>13. TO ASSIST ASSEMBLY OF BEARINGS A. HOUSING MAY BE HEATED TO 250° F MAX AND OUTER RINGS FROZEN B. BEARING INNER RACES MAY BE HEATED IN OIL TO 250° F AND SHAFTS FROZEN</p>			
C	<p>(14) MACHINE 4 HOLES TO .051-.044 Ø X .25-.12 DEEP. USE PLATE, ITEM 41 AS TEMPLATE. INSTALL 4 SCREWS, ITEM 122</p>			
	<p>(15) APPLY PER MIL-STD-130: 80212-4212050</p>			
	<p>(16) WHEN REMOVING RESTRICTOR OR VALVE, USE LEE CO. EXTRACTION TOOL NO. CUTA187C104C</p>			
B	<p>(17) CODE IDENTIFICATION</p> <p>90912 - TWIN DISC INC ROCKFORD, ILL</p> <p>12599 - FLUOROCARBON, MECH SEALS DIV. ANAHEIM, CA</p> <p>80064 - NAVAL SHIPS SYSTEMS COMMAND DEPT OF THE NAVY</p> <p>19207 - U.S. ARMY TANK AUTOMOTIVE COMMAND WARREN, MICH</p> <p>19204 - ROCK ISLAND ARSENAL ROCK ISLAND, ILL</p> <p>36988 - CENTURY SPRING CO LOS ANGELES, CA.</p> <p>23775 - DIE SUPPLY CORP. MACEDONIA, OH</p> <p>51829 - CR INDUSTRIES FRANKLIN, NC</p> <p>97484 - TECHNICAL DEVELOPMENT CO. GLENOLDEN, PA</p>			
A	<p>60380 - TORRINGTON CO. BEARINGS DIV. INGERSOLL-RAND TORRINGTON, CT</p> <p>43991 - FAG BEARING CORP. STAMFORD, CT.</p> <p>92555 - LEE COMPANY WESTBROOK, CT</p> <p>43334 - NEW DEPARTURE - HYATT BEARING DIV GENERAL MOTORS CORP SANDUSKY, OH</p> <p>52676 - SKF INDUSTRIES, INC KING OF PRUSSIA, PA</p> <p>60038 - TIMKEN CO. CANTON, OH</p>			
	8	7	6	5

INC  
A. PA

- (18) FORM FLANGE OF ADAPTER ITEM 43 TO CONTOUR OF HOUSING AT ASSEMBLY MACHINE. 250-20UNC-2B USING ADAPTER AS TEMPLATE. INSTALL 4 SCREWS, ITEM 120.
- (19) FINISH ALL OVER PER CLASS 5, TYPE 1, PER DRWG 2584342 EXCEPT THE FOLLOWING
- (A) FLANGE FACE AND INTERNAL PARTS.
  - (B) AREAS SHOWN AND EXPOSED THREADS
  - (C) FLANGE FACE

REVISIONS		
DATE	BY	REVISION
	A	REVISED TO DATE AND INC ADDN 1970
		11-28-84

[illegible][illegible]

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954	
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FIGURE 5A

8

7

6

5

NOTES

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY FMC/OED FORM 3 DRAWING REQUIREMENTS MANUAL

2	127	MS5152-64	ELBOW	STEEL/CAD	.250 Ø TUBE	
1	126	97464-MS AMF	BREATHER	ALUMINUM	.75-16UNF	
3	125	92555-ETAM75600	RESTRICTOR			
2	124	92555-ETAM75800	RESTRICTOR			
1	123	MS5152-86	ADAPTER	STEEL/CAD	.375 Ø TUBE	
4	122	MS21318-1	SCREW, DRIVE		.058 X .125	
12	121	MS16998-27	SCREW, SOCKET HD	STEEL/CAD	#0-32 UNF X 500	
4	120	MS35764-120	BOLT (PLACE)	STEEL/CAD	250-20 UNC X 75	
8	119	MS9176-24	PLUG, EXPANSION			
118	92555	DT10503000A	VALVE, PRESSURE CONTROL			
117	92555	DT10500250A	VALVE, FLOW CONTROL			
116	4399	MS109177Y	BEARING ROLLER, NEEDLE			
115	60380	WJ323824	BEARING ROLLER, NEEDLE			
114	52676	22218C	BEARING ROLLER, SPHERICAL			
113	60380	TRD-3648	BEARING ROLLER, THRUST			
112	60380	NTA-3648	BEARING ROLLER, THRUST			
111	60380	TRC-2840	BEARING ROLLER, THRUST			
110	60380	NTA-2840	BEARING ROLLER, THRUST			
109	43334	1207TS	BEARING ROLLER, CYLINDER		SINGLE ROW	
108	60038	212088E	BEARING ROLLER, TAPERED		SINGLE ROW	
107	60038	29590-29520	BEARING ROLLER, TAPERED		SINGLE ROW	
106	60038	9006-BEP-00	BEARING ROLLER, TAPERED		SET-RIGHT ASSY	
105	60038	9004-BEP-00	BEARING ROLLER, TAPERED		SET-RIGHT ASSY	
104	90912	33888A	CLUTCH ASSY, 7 INCH			
103	90912	A-2622-F	RING, RETAINING	STEEL		
102	90912	N-904-BB	SEAL			
101	12599	AR43576	SEAL ASSY	TFE/GRAPHITE		
100	12599	AR43575	SEAL ASSY	TFE/GRAPHITE		
99	12599	AR43574	SEAL ASSY	TFE/GRAPHITE		
98	12599	AR43573	SEAL ASSY	TFE/GRAPHITE		
28	97	MS2763-11	WASHER	STEEL/CAD	734 0.0 X 065	
4	96	MS5153-84	SLEEVE	STEEL/CAD	.250 Ø TUBE	
4	95	MS5153-84	NUT	STEEL/CAD	.250 Ø TUBE	
2	94	MS5152-84	TEE	STEEL/CAD	.250 Ø TUBE	
4	93	MS5152-84	ADAPTER	STEEL/CAD	.250 Ø TUBE	
2	92	MS15003-1	FITTING, LUBRICATION	STEEL/CAD	1/8 NPT	
4	91	MS28778-4	PACKING, PREFORMED		.250 Ø TUBE	
6	90	MS28778-6	PACKING, PREFORMED		.375 Ø TUBE	
4	89	MS28778-8	PACKING, PREFORMED		.500 Ø TUBE	
2	88	MS28778-12	PACKING, PREFORMED		.750 Ø TUBE	
2	87	51829	39245 CRW	OIL SEAL	STEEL/NI TUBE	
1	86	51829	34860 CRW	OIL SEAL	STEEL/NI TUBE	
1	85	51829	39821 CRW	OIL SEAL	STEEL/NI TUBE	
1	84	97484	PS548	SIGHT GLASS	ALUMINUM/PLUG	1/4-12
2	83	MS49005-20	PLUG	STEEL/CAD	1/8-27 NPT	
3	82	MS51516-88	PLUG	STEEL/CAD	.500 Ø TUBE	
1	81	MS508P-B2	PLUG	STEEL/CAD	.750 Ø TUBE	
42	80	56988	2874	SPRING COMP.	BRASS WIRE/COP	27.7LB/IN
28	79	23775	H-1	SPRING DIE	STEEL	1080LB/IN
1	78	MS28775-154	PACKING-PREFORMED			
4	77	MS51848-11	WASHER LOCK	STEEL/CAD	.3125 Ø	
4	76	MS16997-80	SCREW, SOCKET HD	STEEL/CAD	.3125-18UNCX100	
18	75	19204	1091074-3	WASHER	STEEL/NI	.375 Ø
8	74	19204	1091074-2	WASHER	STEEL/NI	.3125 Ø
10	73	19204	1091074-1	WASHER	STEEL/NI	.250 Ø
12	72	MS35764-299	BOLT (PLACE)	STEEL/CAD	.375-16UNCX1.75	
6	71	MS35764-127	BOLT (PLACE)	STEEL/CAD	.375-16UNCX1.50	
8	70	MS35764-125	BOLT (PLACE)	STEEL/CAD	.3125-18UNCX1.25	
4	69	MS35764-124	BOLT (PLACE)	STEEL/CAD	.3125-18UNCX1.00	
6	68	MS35764-123	BOLT (PLACE)	STEEL/CAD	.250-20UNFX.75	
2	67	MS172249	NUT	STEEL		
1	66	MS172214	LOCKWASHER	STEEL		
1	65	MS172222	LOCKWASHER	STEEL		
1	64	MS19073-181	LOCKWASHER	STEEL		
1	63	MS19066-18	NUT	STEEL		
1	62	MS19070-09	LOCKWASHER	STEEL		
2	61	MS19068-09	NUT	STEEL		
60	80064	2507066-1	RING, SEALING	C.I.	AMS7310	
1	59	MS16562-96	PIN, SPRING	STEEL	.062 Ø X .250	
4	58	MS16562-140	PIN, SPRING	STEEL	.86 Ø X .500	
1	57	MS1596-8Y	WASHER, SEAL	STEEL/RUBBER		
1	56	MS16674-366	RING, RETAINING			
2	55	MS16674-330	RING, RETAINING			
1	54	MS16674-328	RING, RETAINING			

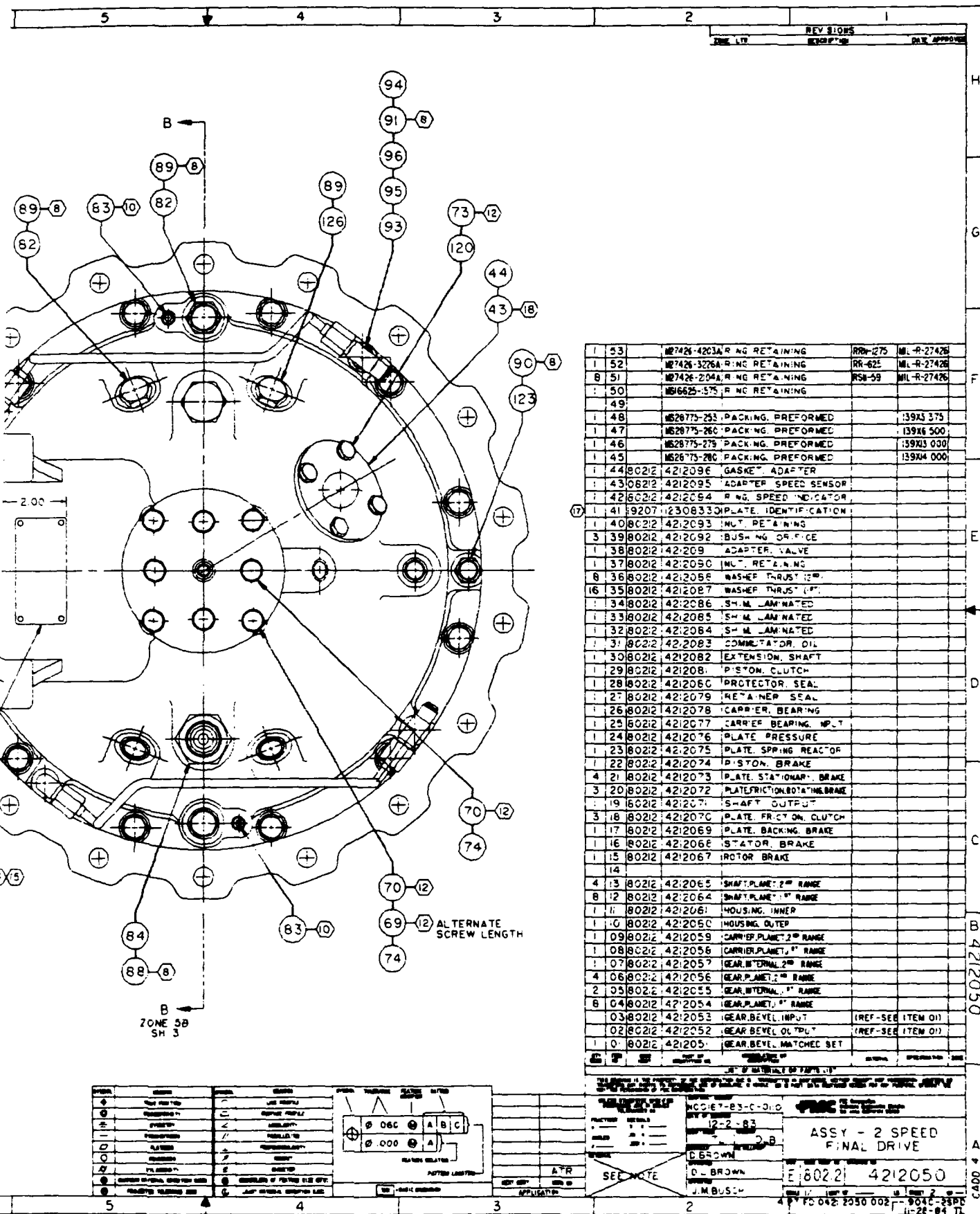
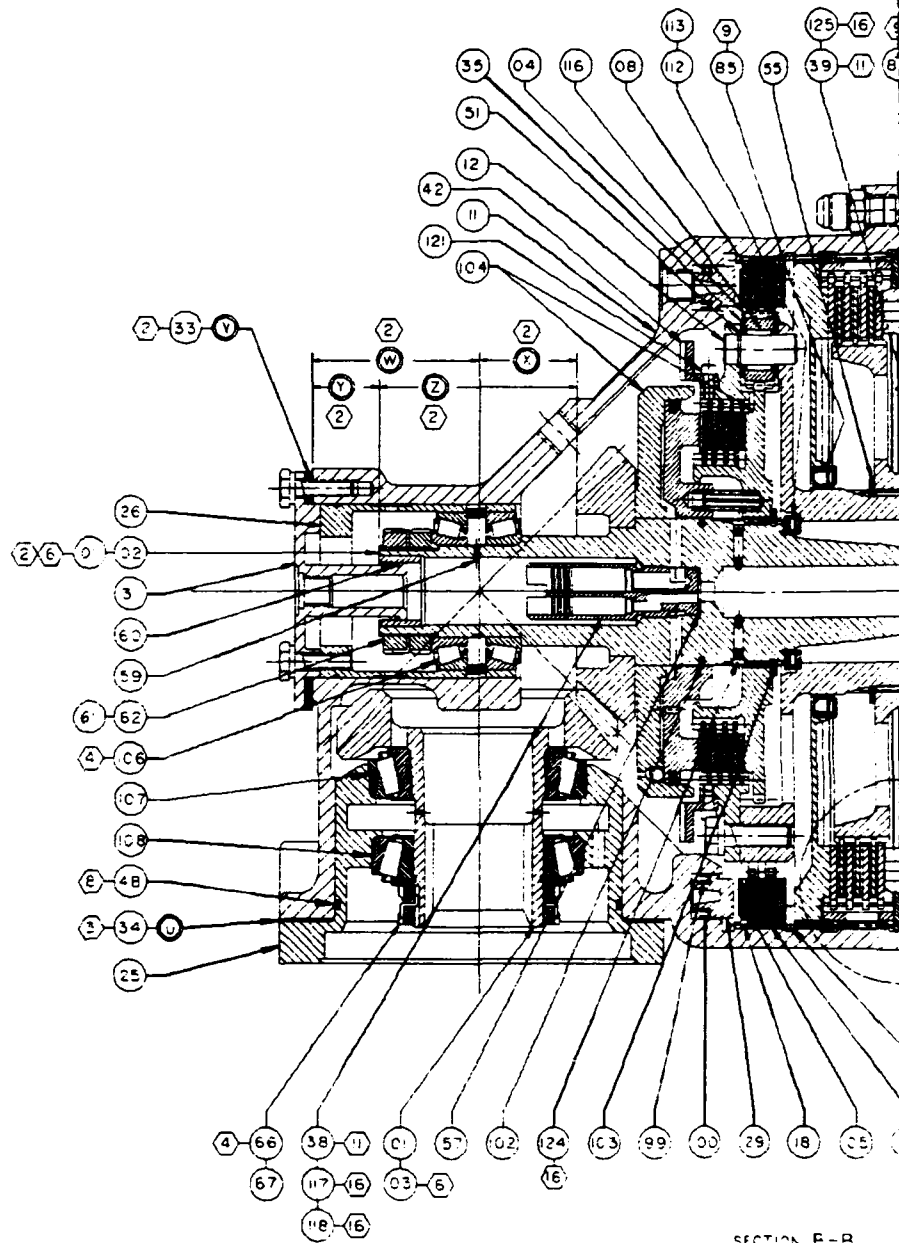


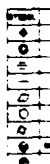
FIGURE 5B

NOTES:

1. INTERPRET DRAWING IN ACCORDANCE WITH  
STANDARDS PRESCRIBED BY FMC/DEI FORM 3  
DRAWING REQUIREMENTS MANUAL



SECTION E-B  
ZONE 5-BIS-2



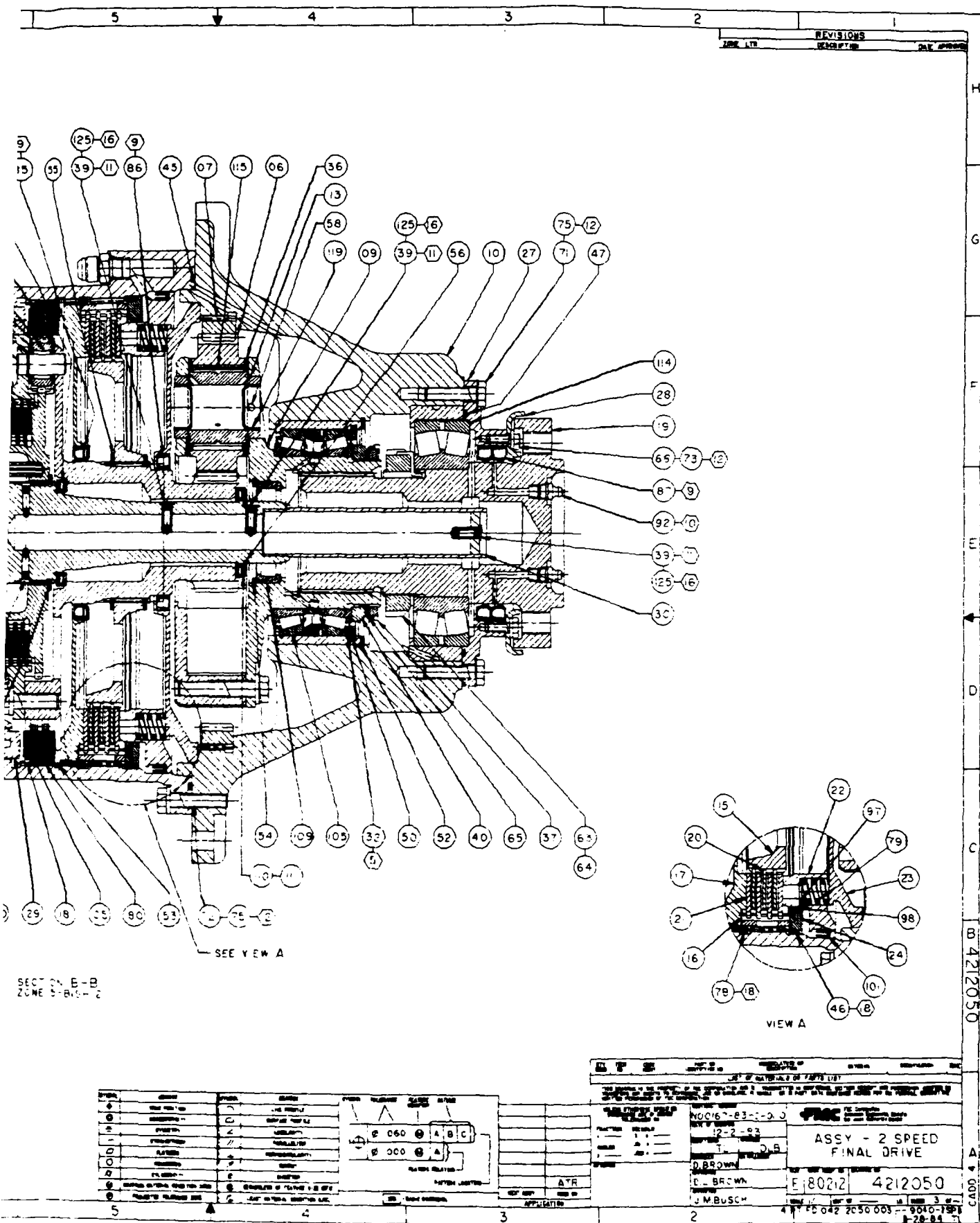
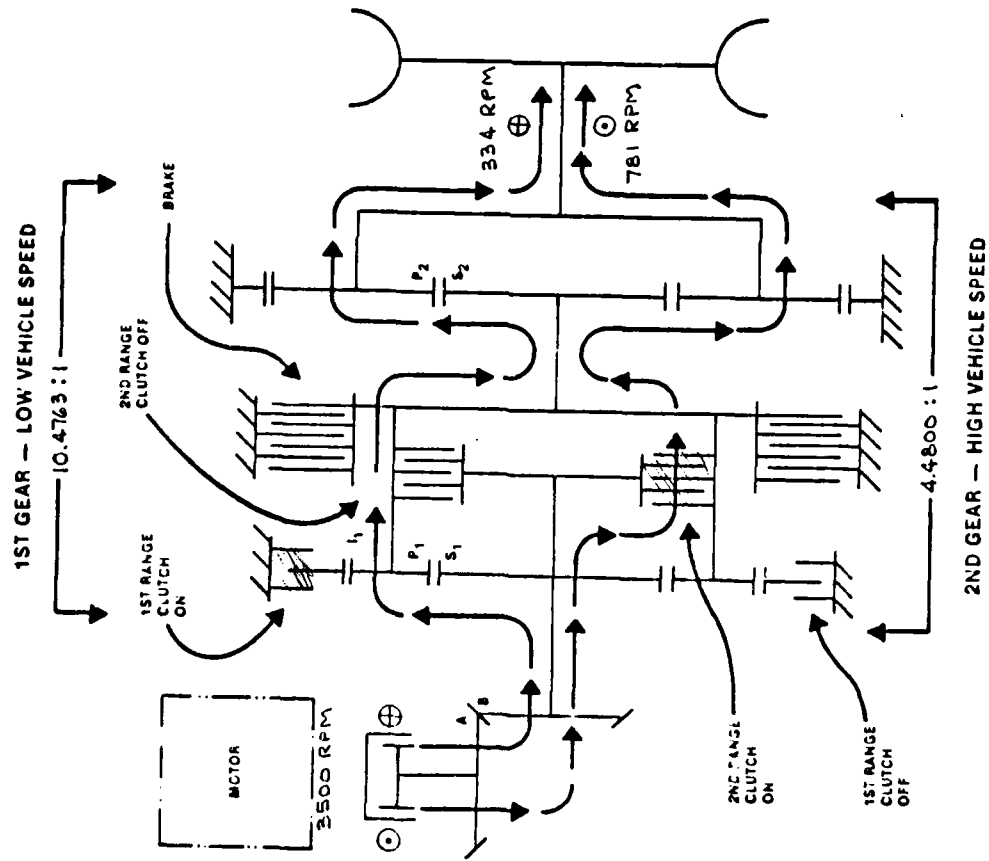


FIGURE 5C

FMC



GEAR	NO. OF TEETH	
A	24	BEVEL
B	24	
I <sub>1</sub>	174	8 PLANETS 16 P <sub>1</sub> 2.3385
P <sub>1</sub>	22	
S <sub>1</sub>	130	
I <sub>2</sub>	87	4 PLANETS 8 P <sub>2</sub> 4.4800
P <sub>2</sub>	25	
S <sub>2</sub>	25	

RATIOS

$$R_1 = \frac{174 \times 130}{130} = 2.3385$$

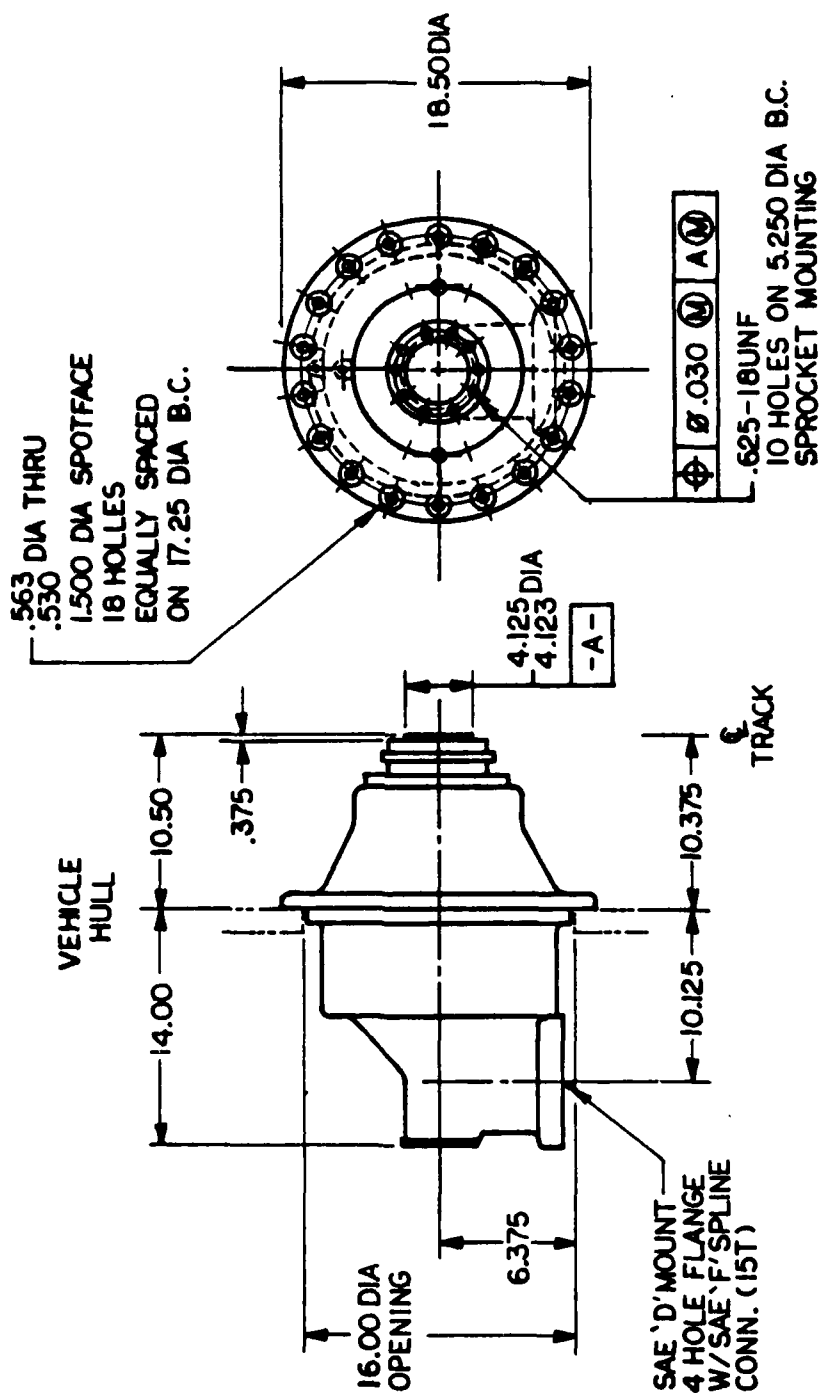
$$\text{HIGH} = R_2 = \frac{87 \times 25}{25} = 4.4800$$

$$\text{LOW} = \text{TOTAL} = R_1 \times R_2 = 10.4763$$

$$\frac{10.4763}{10.35} - 1 = 0.012 \text{ or } 1.2\%$$

2% is Allowed.

FIGURE 6

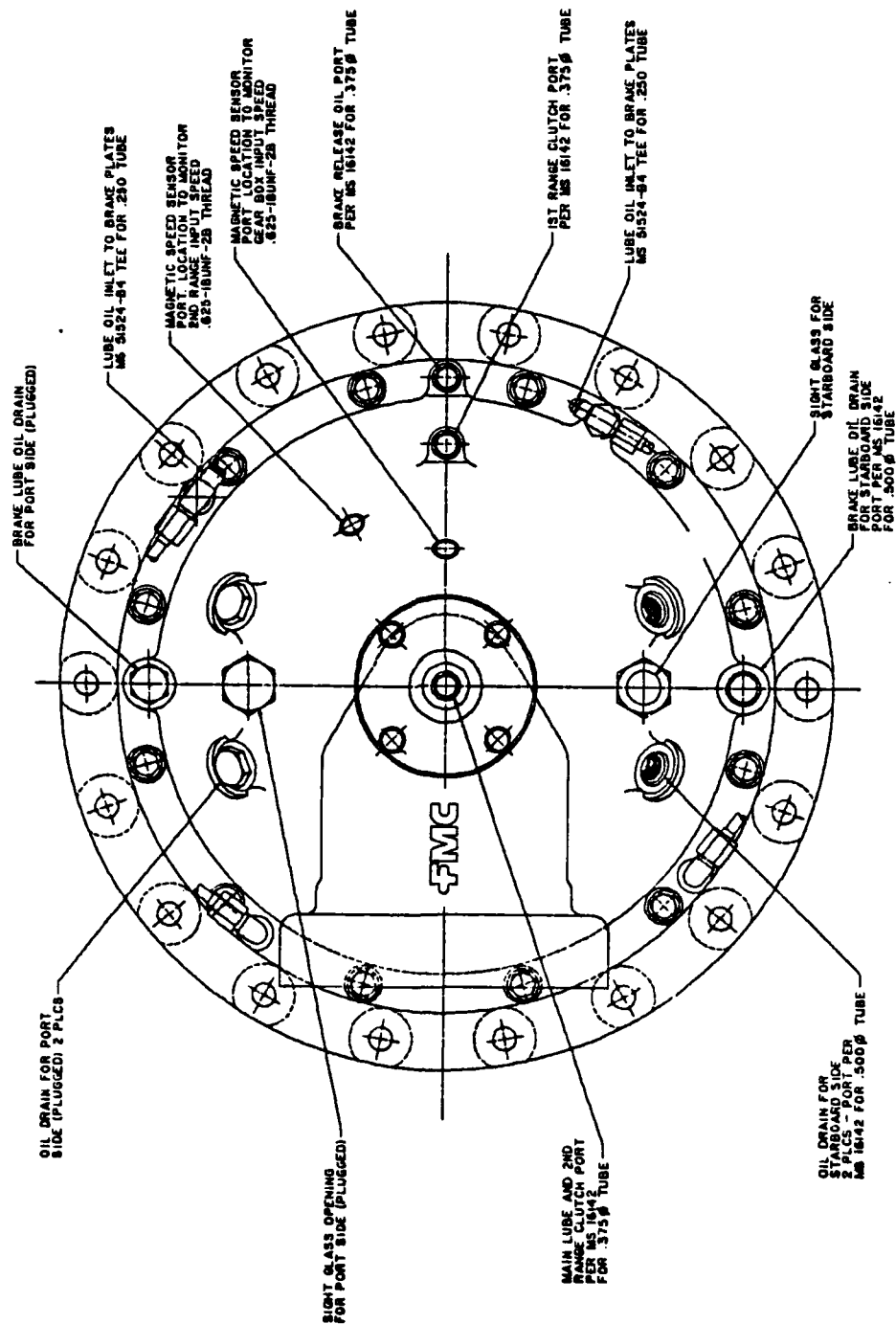


LOW REDUCTION RATIO: 4.4800: 1  
HIGH REDUCTION RATIO: 10.4763: 1

19



FMC



2-SPEED FINAL DRIVE-SHOWN FOR STARBOARD SIDE REAR DRIVE INSTALLATION

FIGURE 8

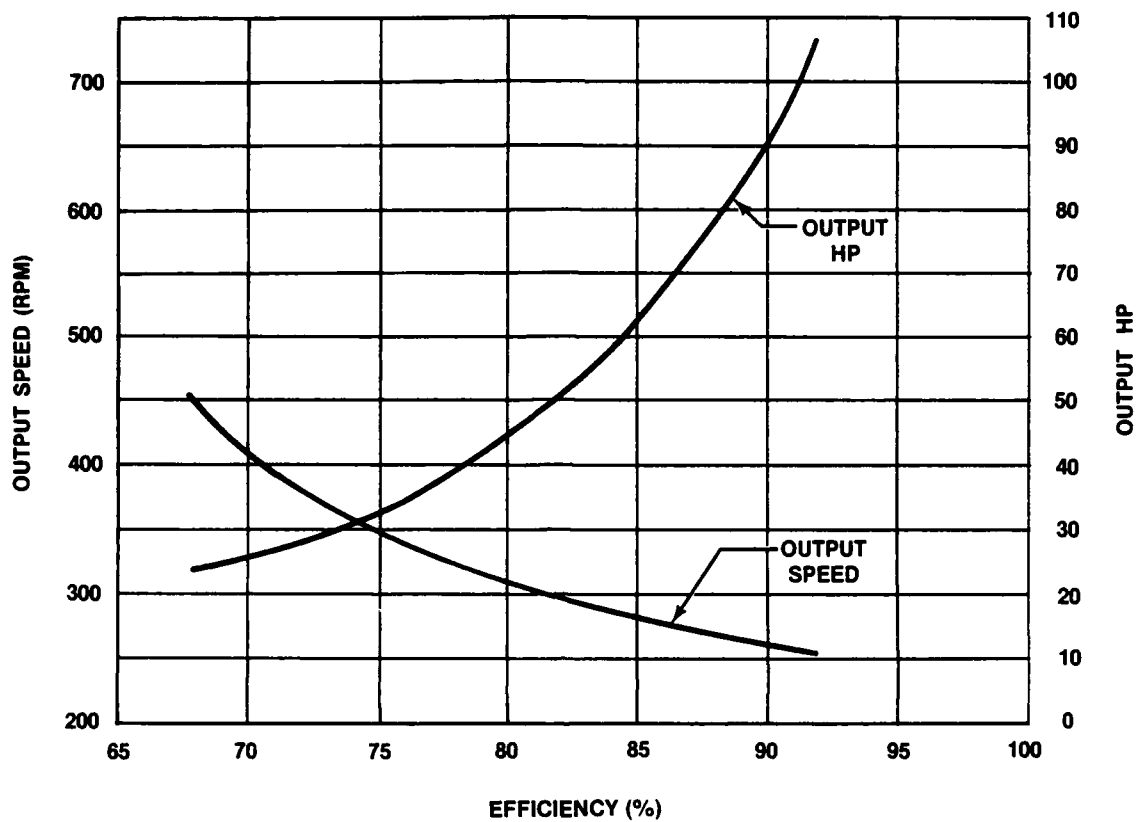


Figure 9. Two-Speed Final Drive Ratio 4.4800

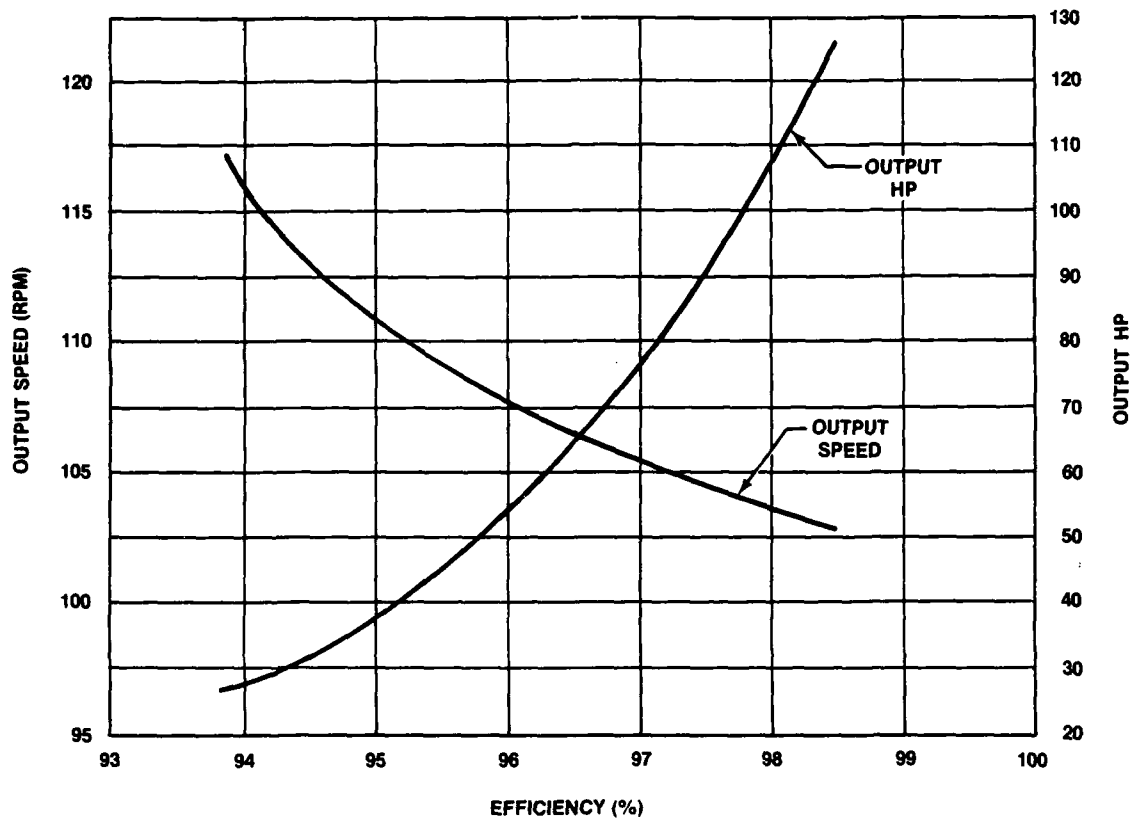
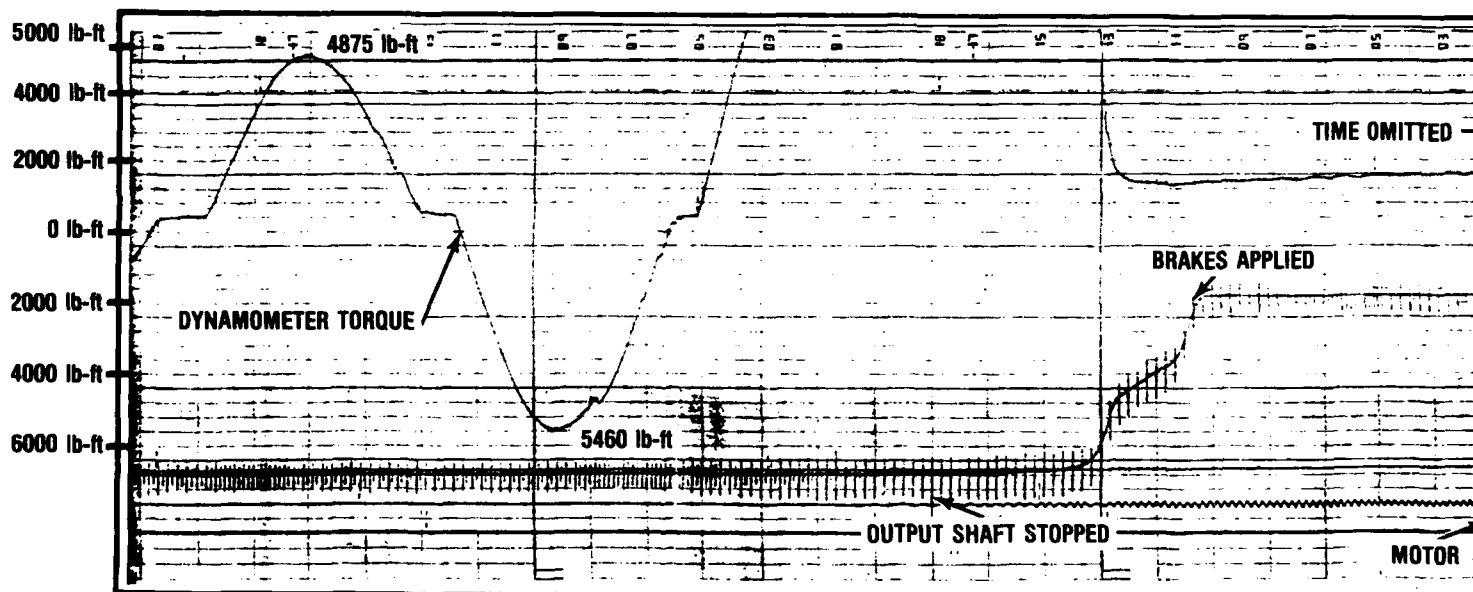
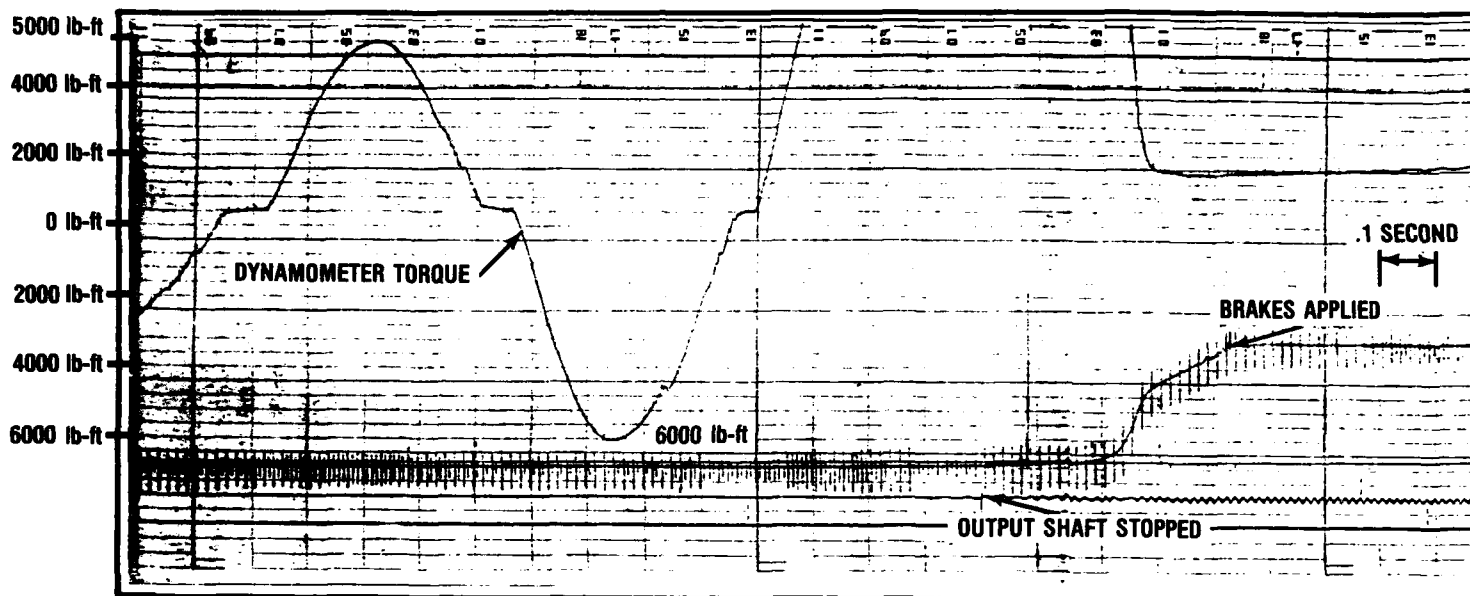


Figure 10. Two-Speed Final Drive Ratio 10.4763



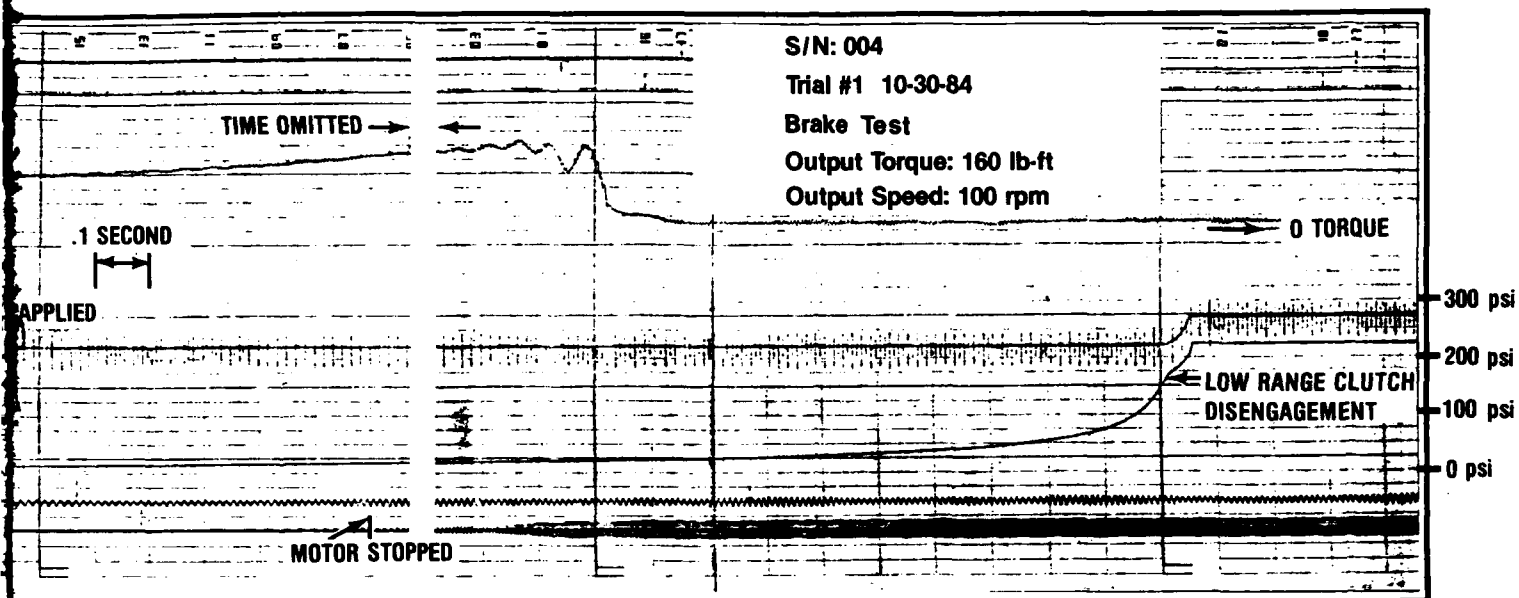


Figure 11. Dynamic Brake Test, Trial 1.

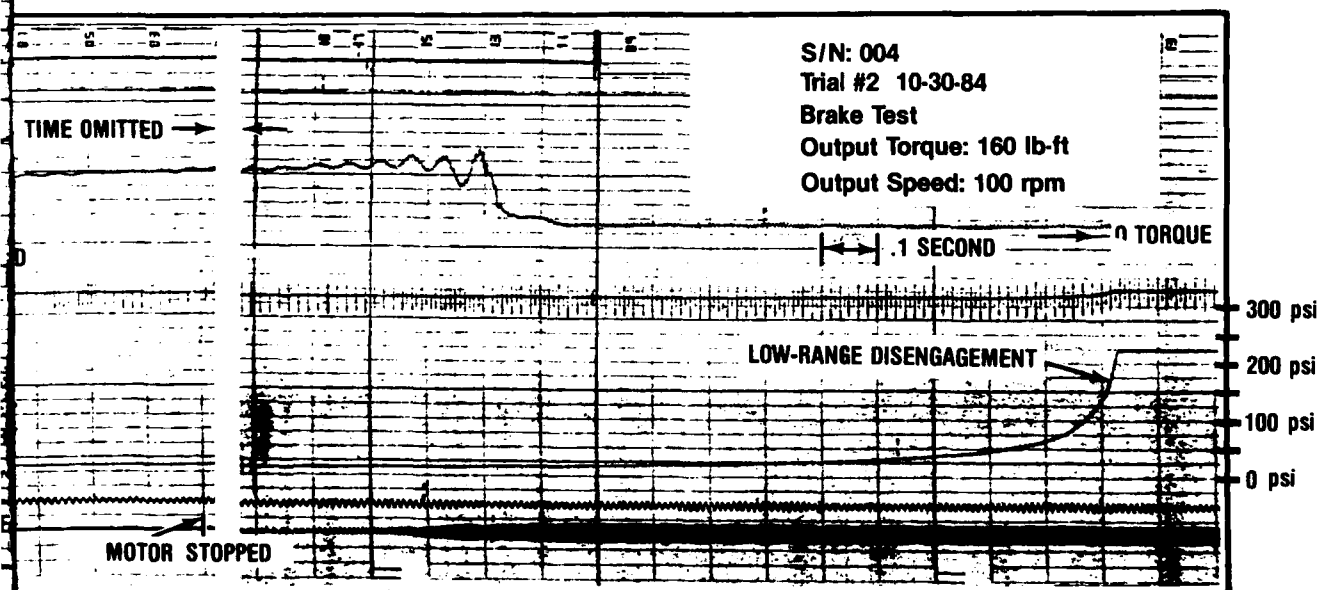


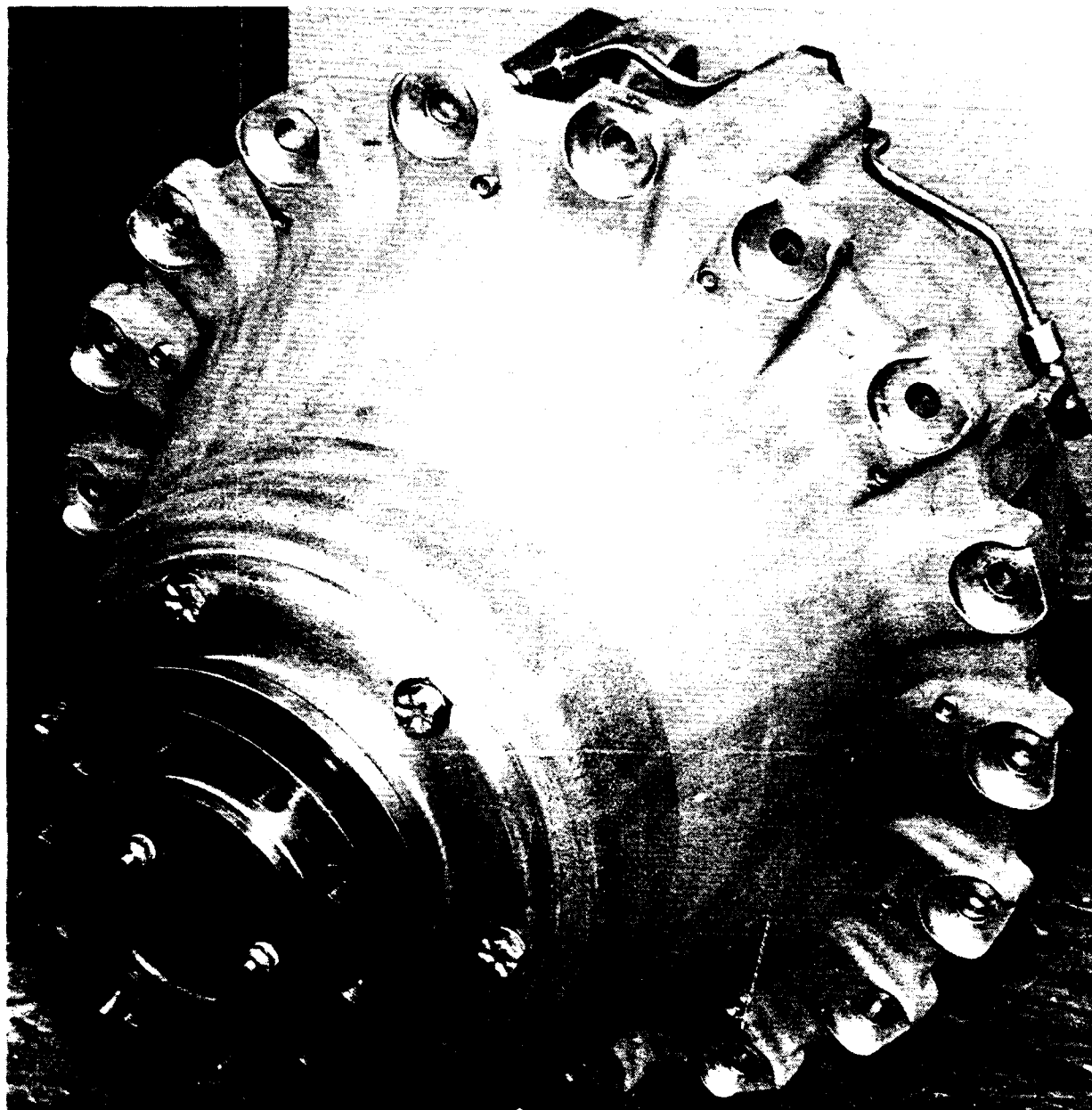
Figure 12. Dynamic Brake Test, Trial 2.

Appendix 1

Photographs of Two-Speed Final Drive

**FMC**

**FMC**

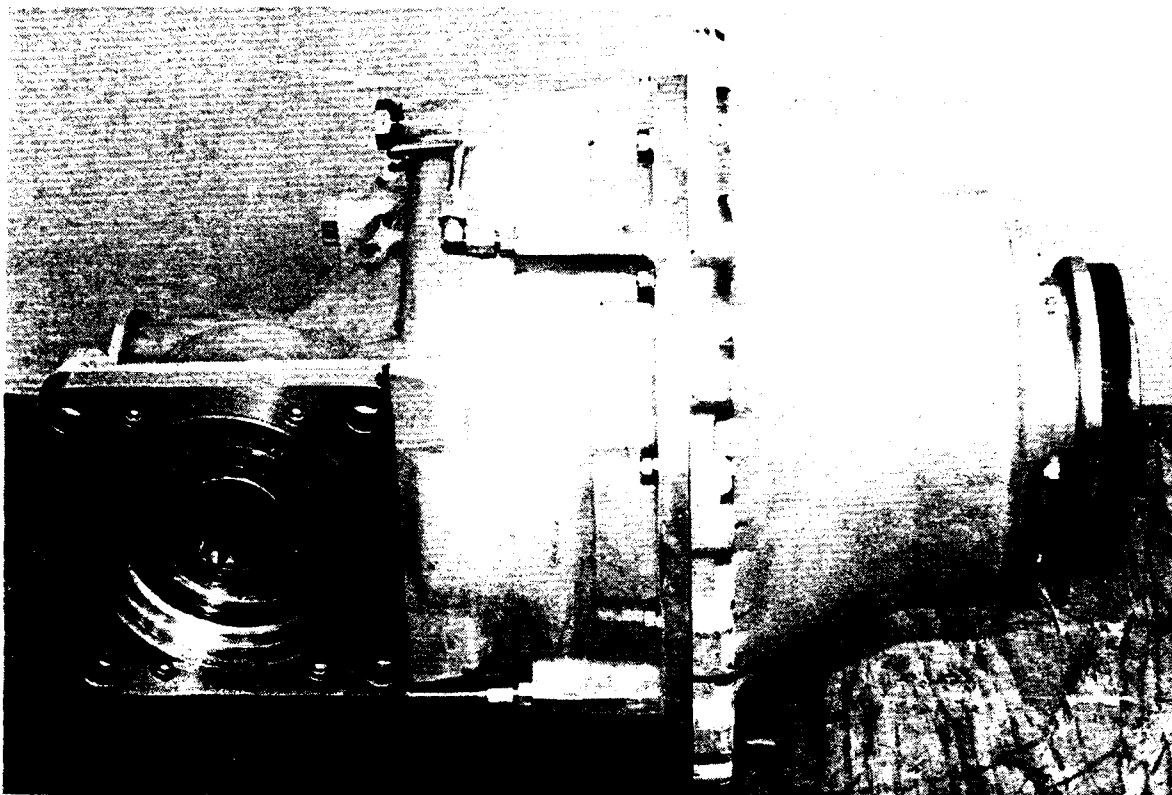


**Two-speed Final Drive Assembly**

**86093**

**FMC**

**FMC**



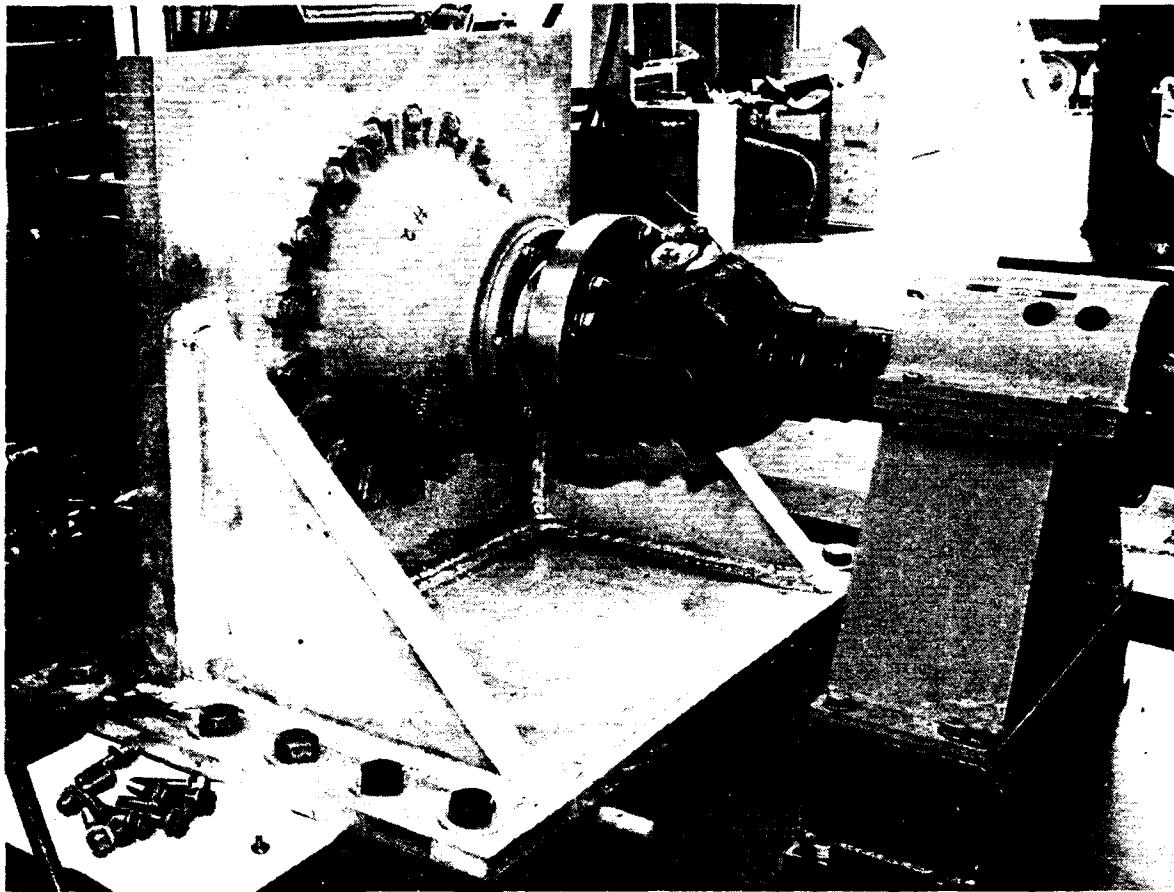
**View Input of Two-speed  
Final Drive Assembly**

86095



**FMC**

**FMC**

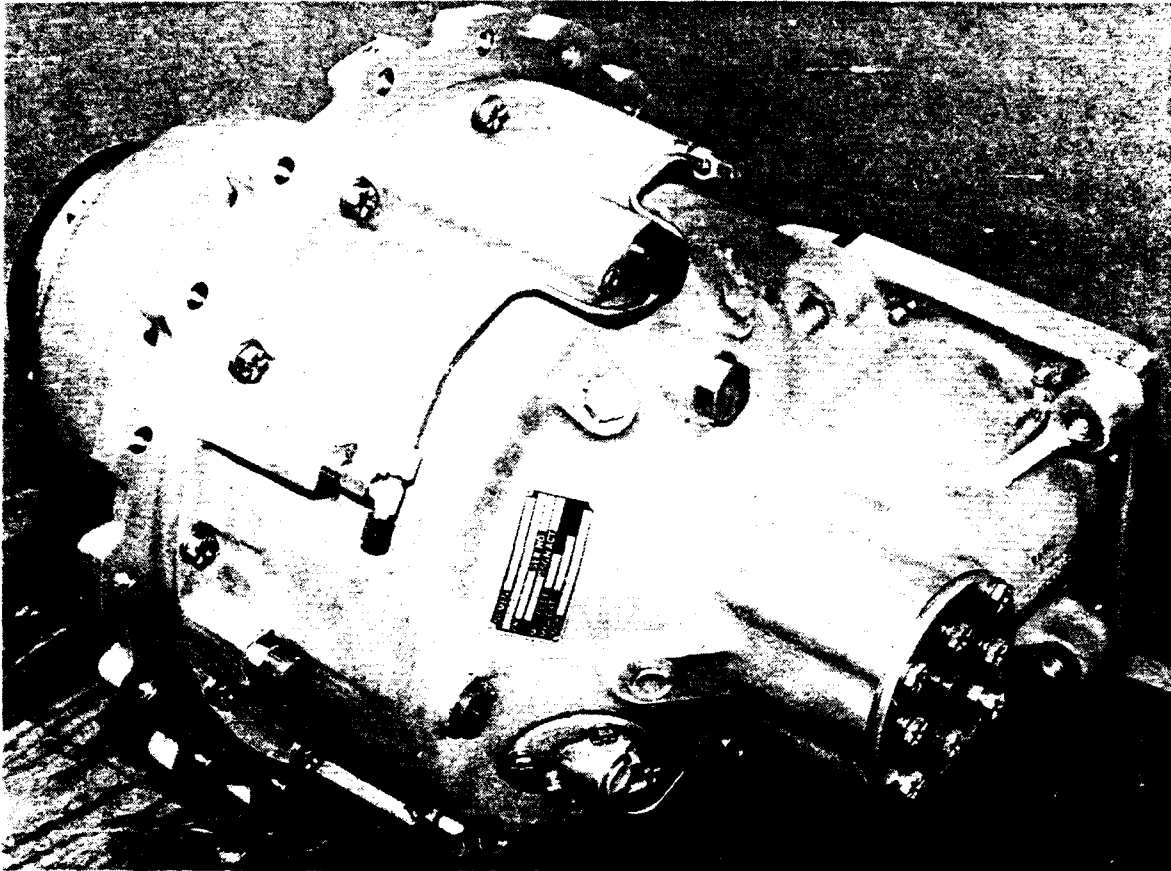


**Two-speed Final Drive  
Mounted in Test Stand**

86096

**FMC**

**FMC**

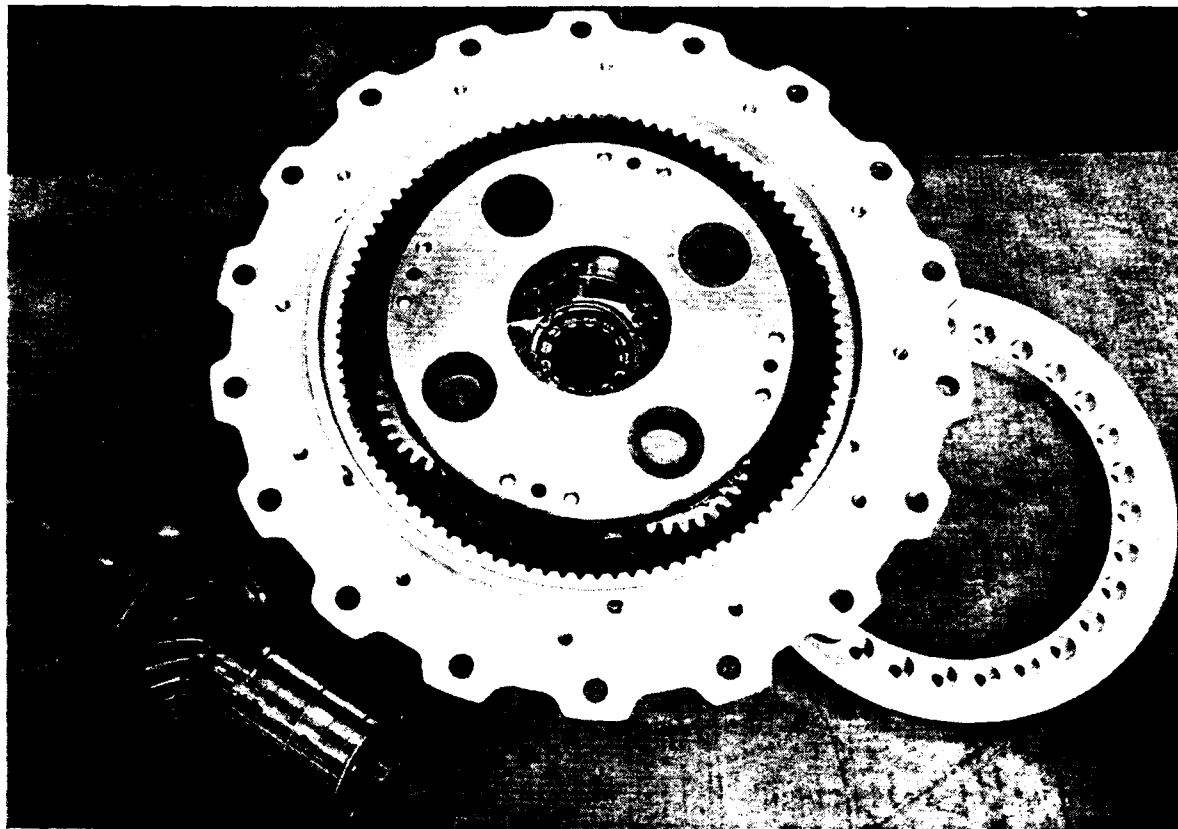


**Two-speed Final Drive Assembly**

**86094**

**FMC**

**FMC**



**Two-speed Final Drive  
Output Section**

86092

Appendix 2

Letter Report Modification P00009

TECHNICAL REPORT  
TWO-SPEED FINAL DRIVES  
FOR A 14-TON AMPHIBIOUS VEHICLE

Development Progress for the Requirements  
of Amendment P00009 to the Contract

Prepared Under Contract No. N00167-83-C-0110

Prepared for the  
DAVID TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER  
MARK RICE

Contracting Officers Technical Representative

by

FMC CORPORATION  
ORDNANCE DIVISION ENGINEERING  
SAN JOSE, CALIFORNIA 95108

Prepared by:

JOHN BUSCH  
DICK BROWN  
Power Transmission Staff

NADINE BARR  
Engineering Test Staff

## 1. Introduction

This report summarizes the work performed under contract N00167-83-0110 modification P00009 with the David Taylor Naval Ship Research and Development Center.

Two tasks were required by this modification.

- o Task 1 - Determination of time lags during Clutch Engagement and Disengagement
- o Task 2 - Teardown, Visual Inspection, and Reassembly of the Third Final Drive Unit

## 2. Discussion

The results of the work performed under modification P00009 are discussed in detail in the following paragraphs. In this report First Gear of Low Range will refer to the vehicle's low speed range (10.4763:1) and Second Gear or High Range will refer to the vehicle's high speed range (4.480:1).

### 2.1 Task 1

#### Two-Speed Final Drive Clutch Engagement and Disengagement Test

Two of four Two-Speed Final Drives (S/N 3 and 4) were tested for clutch engagement and disengagement times. The twenty-hour functional testing per Test Plan 10130, Revision B, will be covered by a separate report included in the final Technical Report.

Clutch actuation times are dependant on the design of the shift control system and on the flow applied to actuate the clutch. The actuation time for the high range clutch also depends on the operating conditions of the final drive. Tables 1 and 2 show the clutch range, output torque, output speed and clutch actuation time for both final drives. To decrease the engagement times for either clutch, the flow must be increased.

Figure 1 compares the actual test data with the clutch vendors computer calculations for high range clutch actuation times with flows of 15-GPM and 20-GPM. The comparison indicates that FMC's test system was supplying between 17 and 18 GPM clutch actuation flow. Based on the test data, the design actuation flow should be 18-GPM.

The stationary piston clutch (low range) actuation time depends only on the design of the shift control system and the actuation flow. The low range disengagement time depends on the piston return spring pressure oil return and the restriction in the oil return line back to tank. The test data shown in Tables 1 and 2 reflect the results of 17 to 18-GPM average flow during engagement. The disengagement times were measured from 225-PSIG down to 25 PSIG, however, the engagement of the following clutch can begin before the initial clutch is fully disengaged.

Figure 2 shows a schematic of the shift control system used for actuating the clutches for all the two speed final drives testing.

Figure 3 shows the location of the pressure transducers used to indicate the pressure on the traces.

The strip charts (Figures 4 through 19) for the trials indicated in Tables 1 and 2 are included.

Table 1. Clutch Actuation Times for Final Drive S/N 003, output speed = 200 rpm. Accumulator charge pressures = 100 psig.

TRIAL NO.	DATE	CLUTCH	OUTPUT TORQUE (lb-ft)	ACTUATION TIMES	
				ENGAGE (sec+.01)	DISENGAGE (sec+.01)
1A	10-18	HIGH	300	.092	.066
1B	10-18	HIGH	300	.103	.064
1C	10-18	HIGH	300	.094	.070
2	10-18	HIGH	500	.090	.075
3	10-18	HIGH	1000	.090	.070
4A	10-18	LOW	300	.160	.250
4B	10-18	LOW	300		.262
5A	10-18	LOW	500	.150	.250
5B	10-18	LOW	500	.220	.230
6A	10-18	LOW	1000	.200	.270
6B	10-18	LOW	1000	.161	.320
6C	10-18	LOW	1000	.280	.320

Times were measured from the time lines on the traces and are taken from the point that the pressure starts to increase or decrease to the point where the pressure begins to stabilize.

Table 2. Clutch Actuation Times for Final Drive S/N 004, output speed = 200 rpm. Accumulator charge pressures = 100 psig.

TRIAL NO.	DATE	CLUTCH	OUTPUT TORQUE (lb-ft)	ACTUATION TIMES	
				ENGAGE (sec±.01)	DISENGAGE (sec±.01)
4	10-25	HIGH	300	.100	.080
5A	10-25	HIGH	500	.115	.095
5B	10-25	HIGH	500		.075
6	10-25	HIGH	1000	.098	.070
1	10-25	LOW	300	.320	.340
2	10-25	LOW	500	.240	.320
3	10-25	LOW	1000	.266	.262

Times were measured from the time lines on the traces and are taken from the point that the pressure starts to increase or decrease to the point where the pressure begins to stabilize.

Table 3. Ball seating delay calculations (obtained from clutch vendor) for given apply flows and an apply pressure of 225 psig.

INPUT SPEED (rpm)	APPLY PRESS (psig)	EXIT FLOW (gpm)	PRESSURE REQUIRED (psig)	TIME TO ENGAGE HIGH RANGE FOR VARIOUS APPLIED FLOWS		
				10gpm (sec)	15gpm (sec)	20gpm (sec)
3000	225	3.78	150	.1962	.1235	.0901
2000	225	2.52	67	.1891	.1206	.0885
1500	225	1.89	37	.1872	.1199	.0882
1000	225	1.26	17	.1835	.1183	.0873

The "Exit Flow" is the flow required to seat the ball and the "Pressure Required" is the pressure on the ball created by the exit flow. The "Applied Flow" includes the "Exit Flow." Calculations were based on a total piston travel of .170 inches when the plates are new and a piston area of 37.687 square inches.



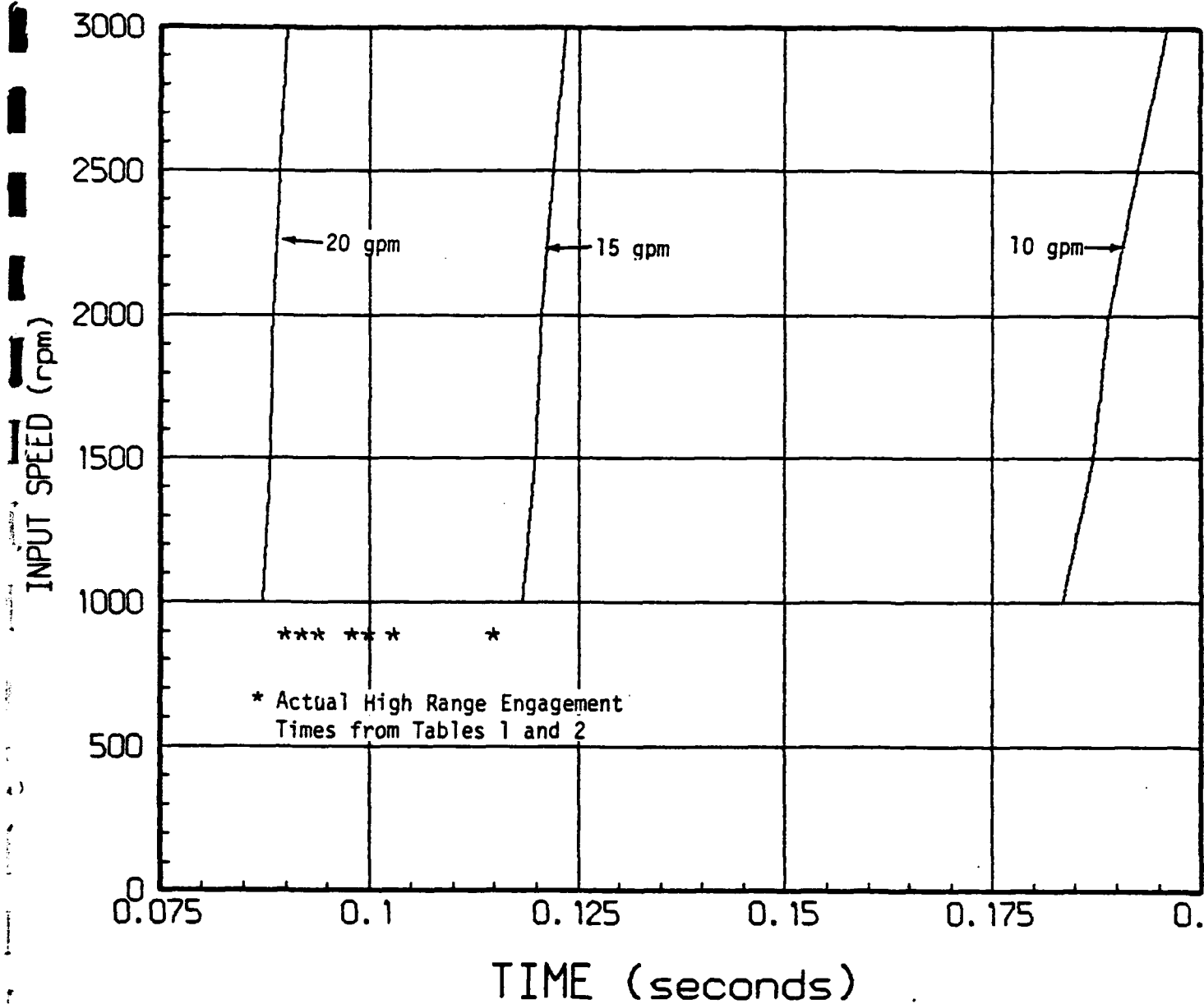


Figure 1. High Range Engagement Times vs. Input Speed for Vendor Calculations in Table 3 and Actual High Range Engagement Times from S/N's 003 and 004 in Tables 1 and 2.

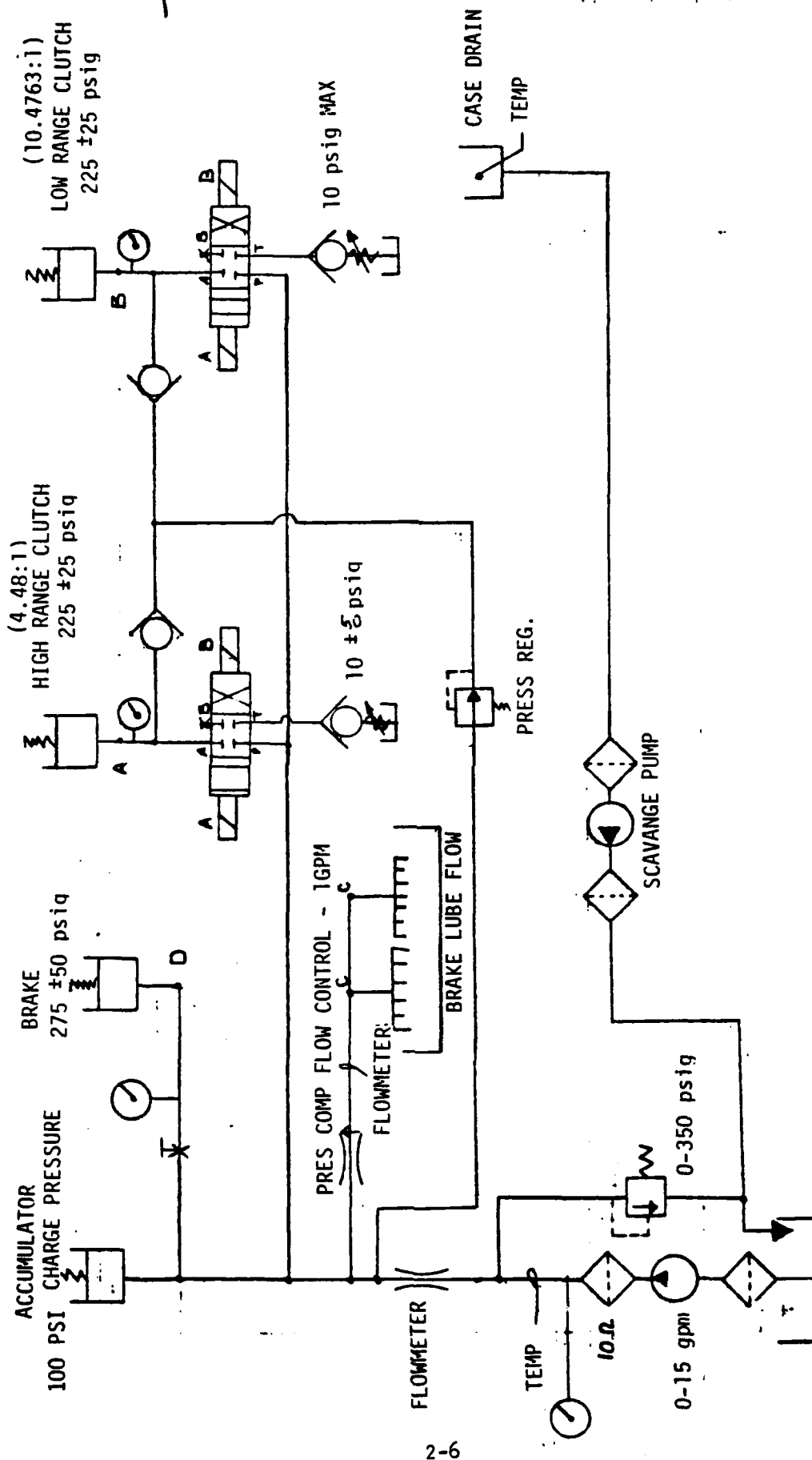


Figure 2 . Two-Speed Final Drive Shift Control

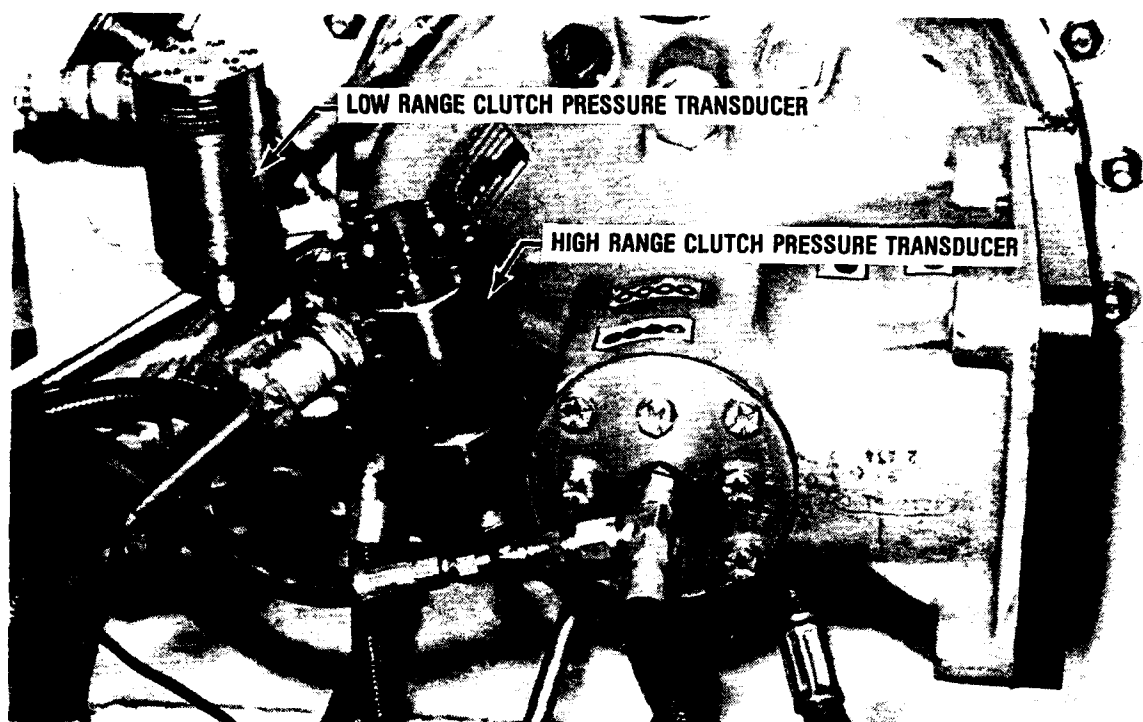


Figure 3. High and Low Range Pressure Transducer Locations

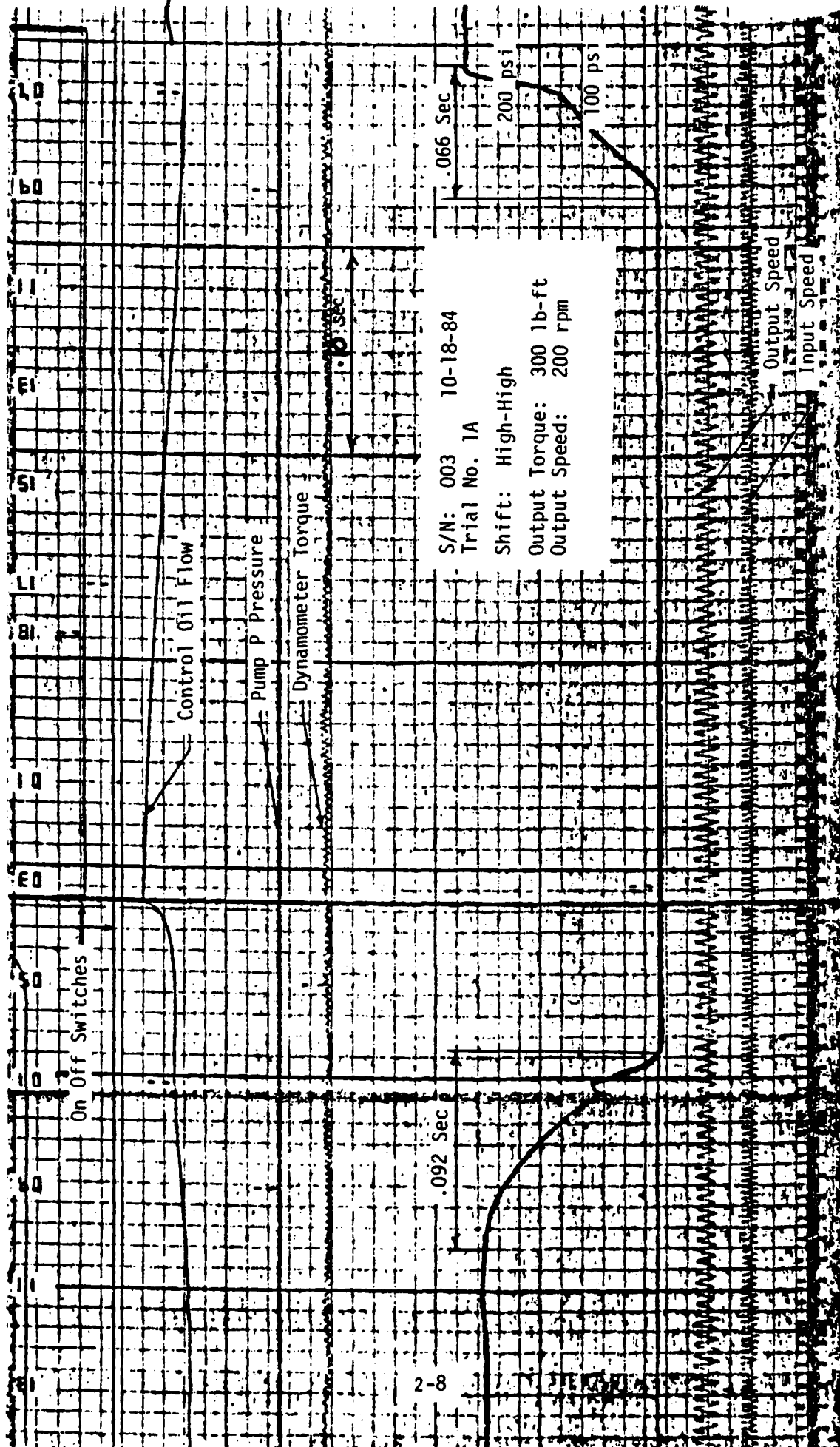
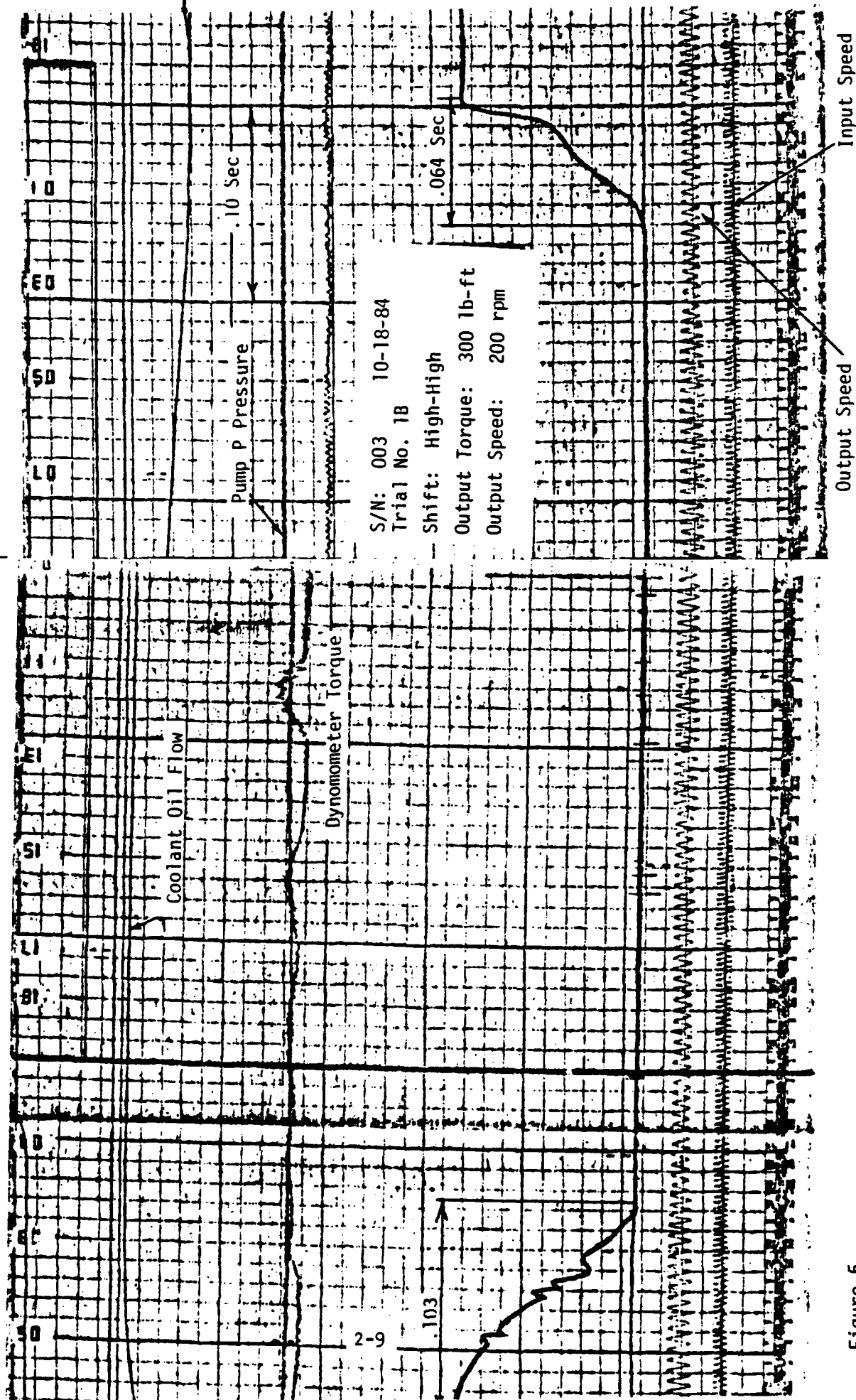


Figure 4.



**Figure 5.**

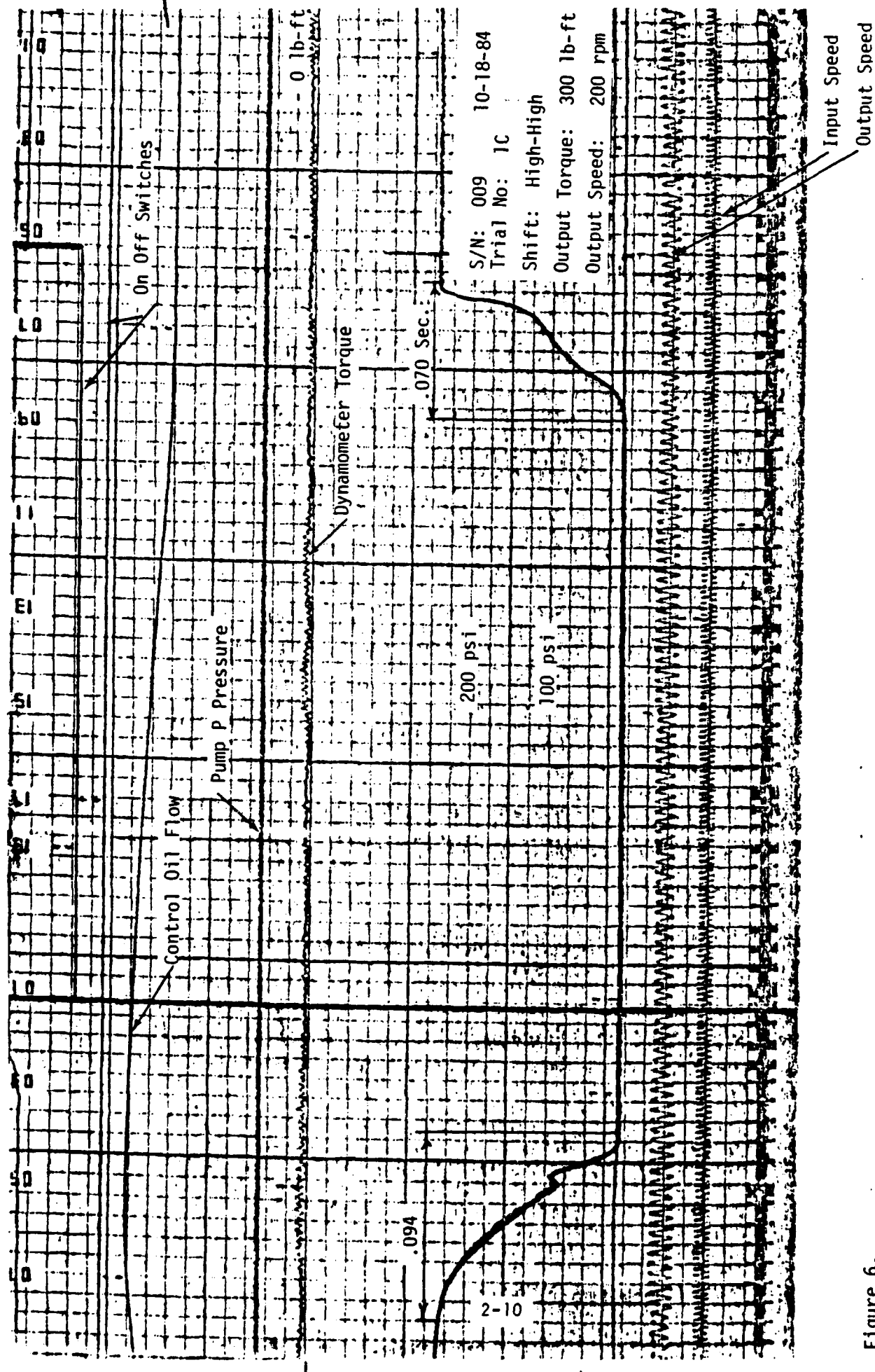


Figure 6.

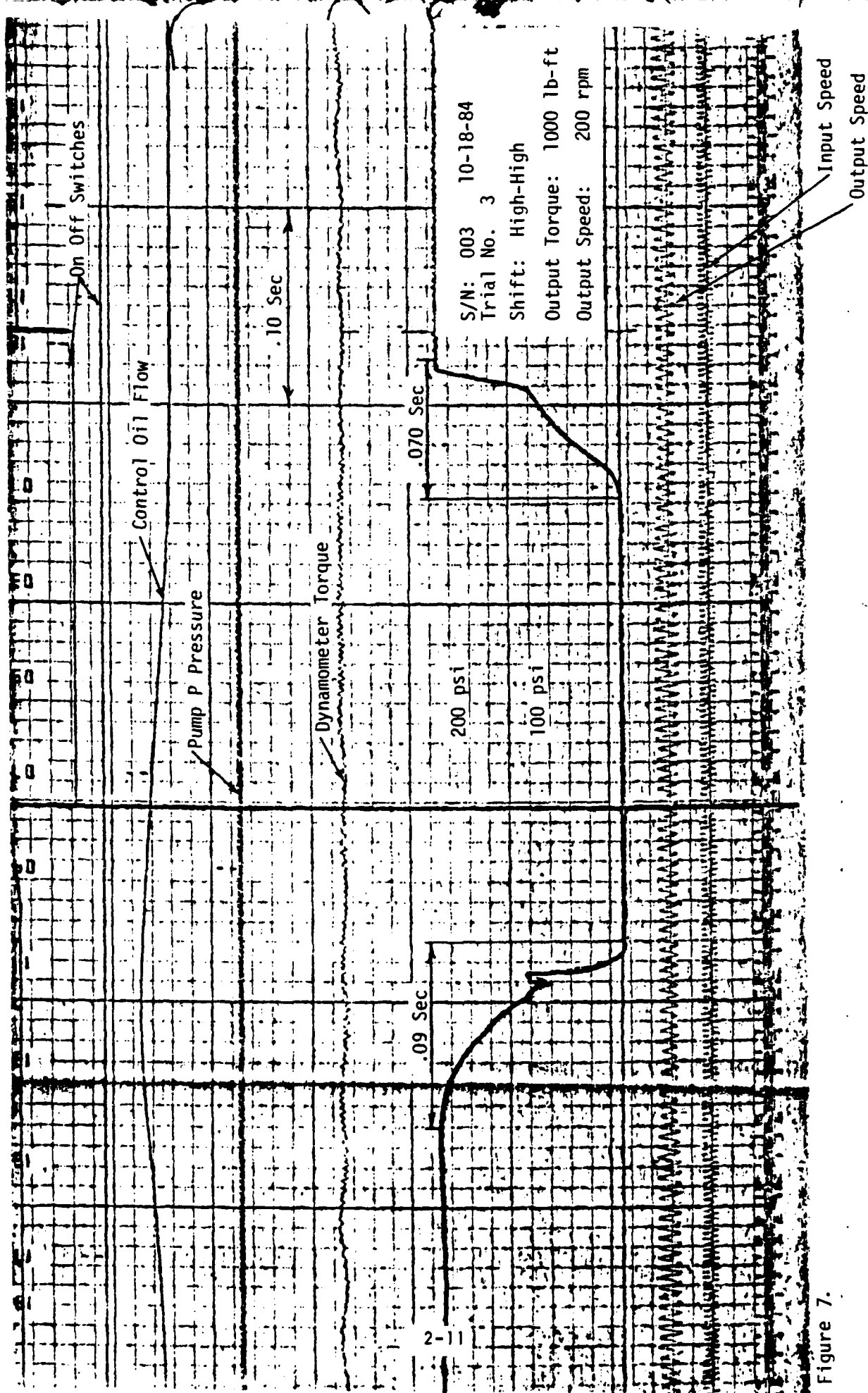


Figure 7.

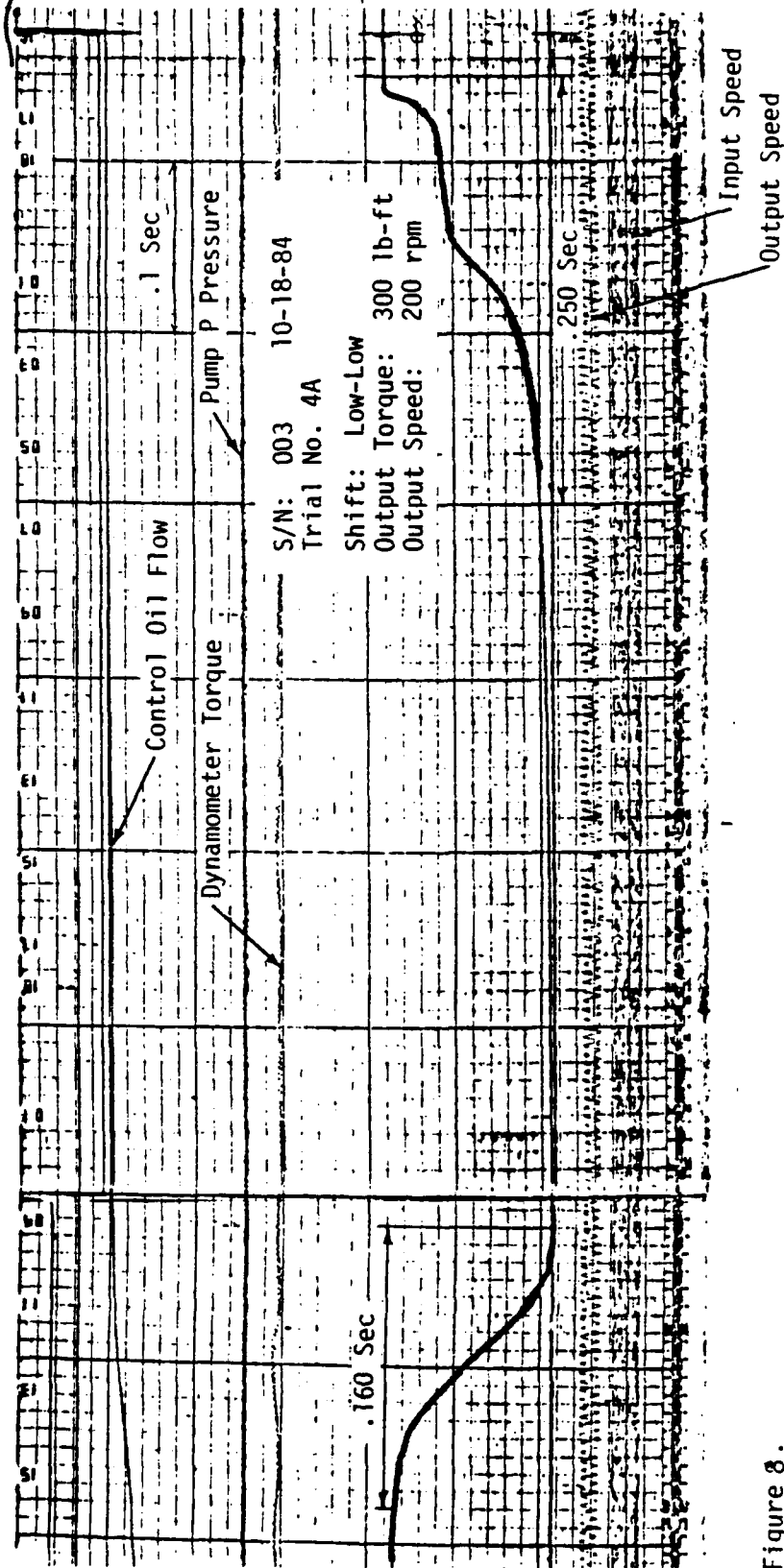


Figure 8.



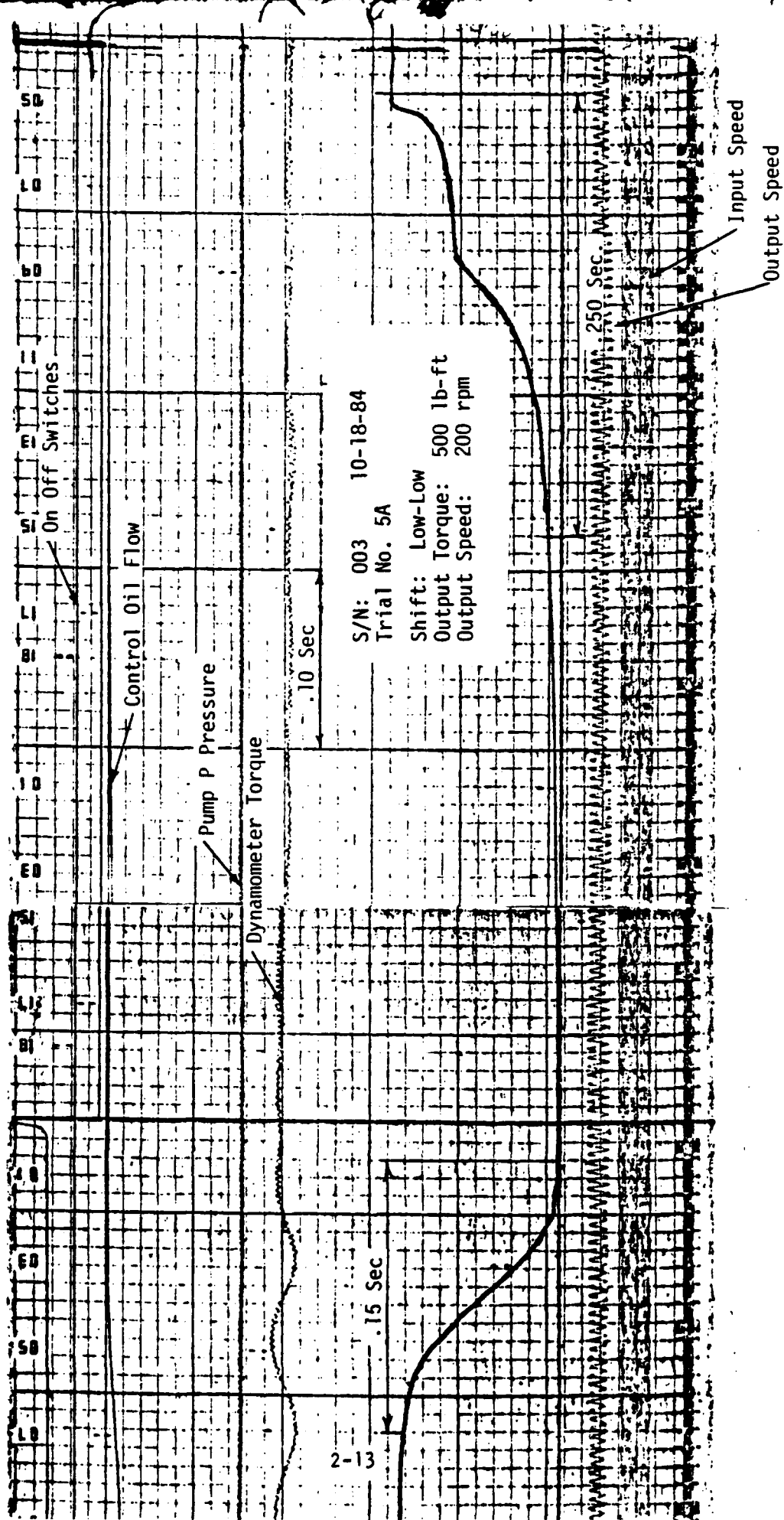


Figure 9.

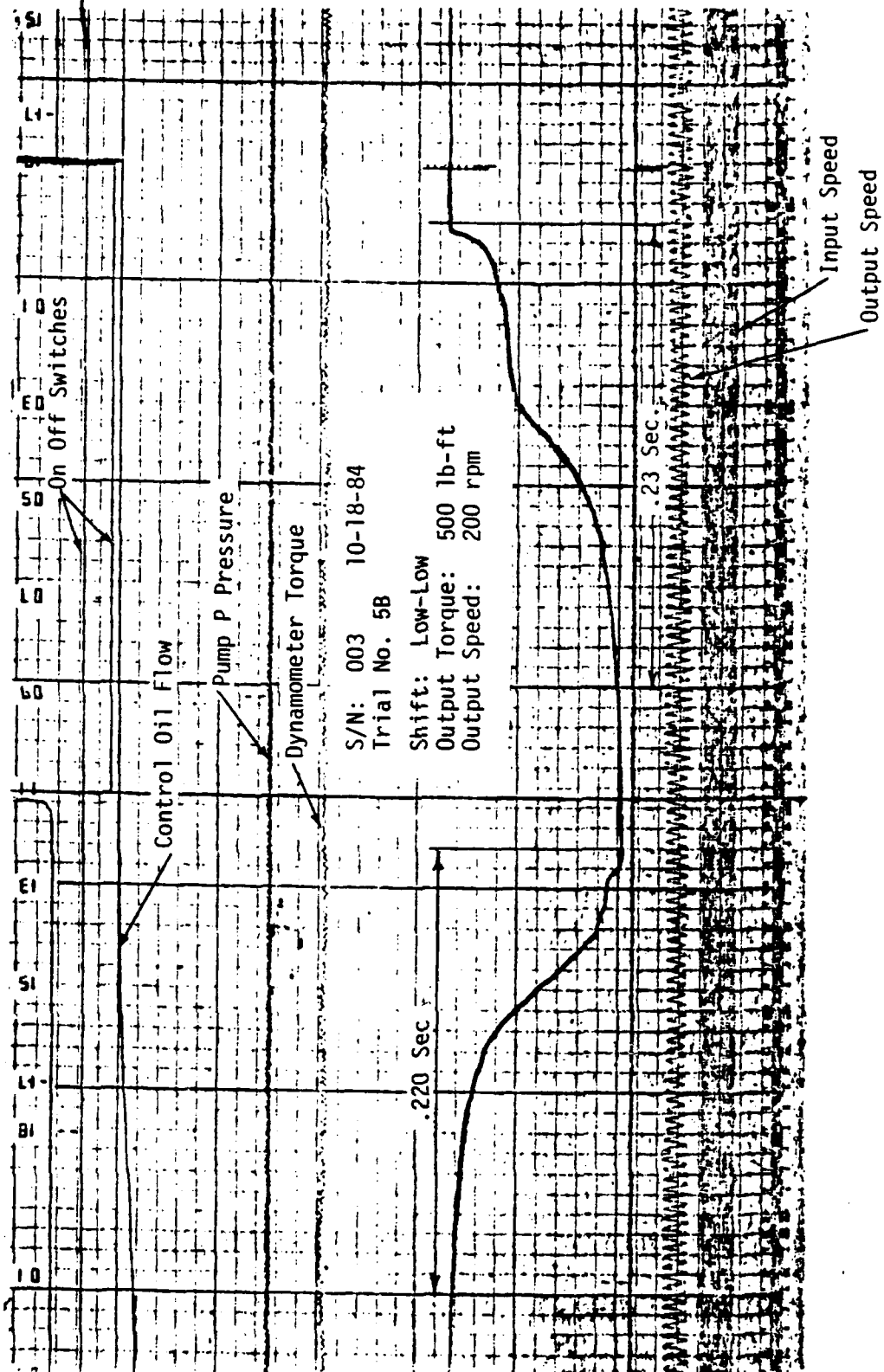


Figure 10.

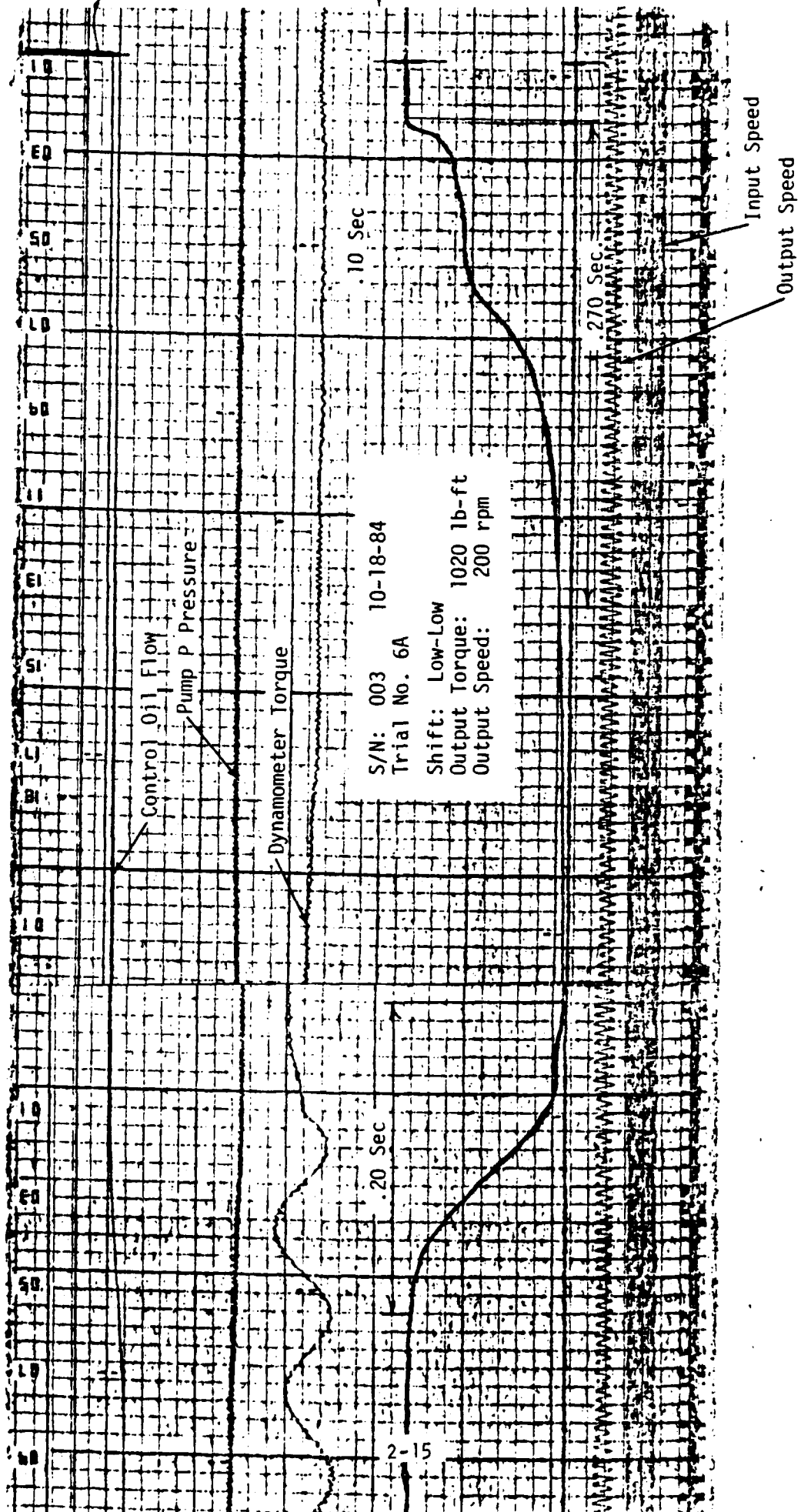


Figure 11.

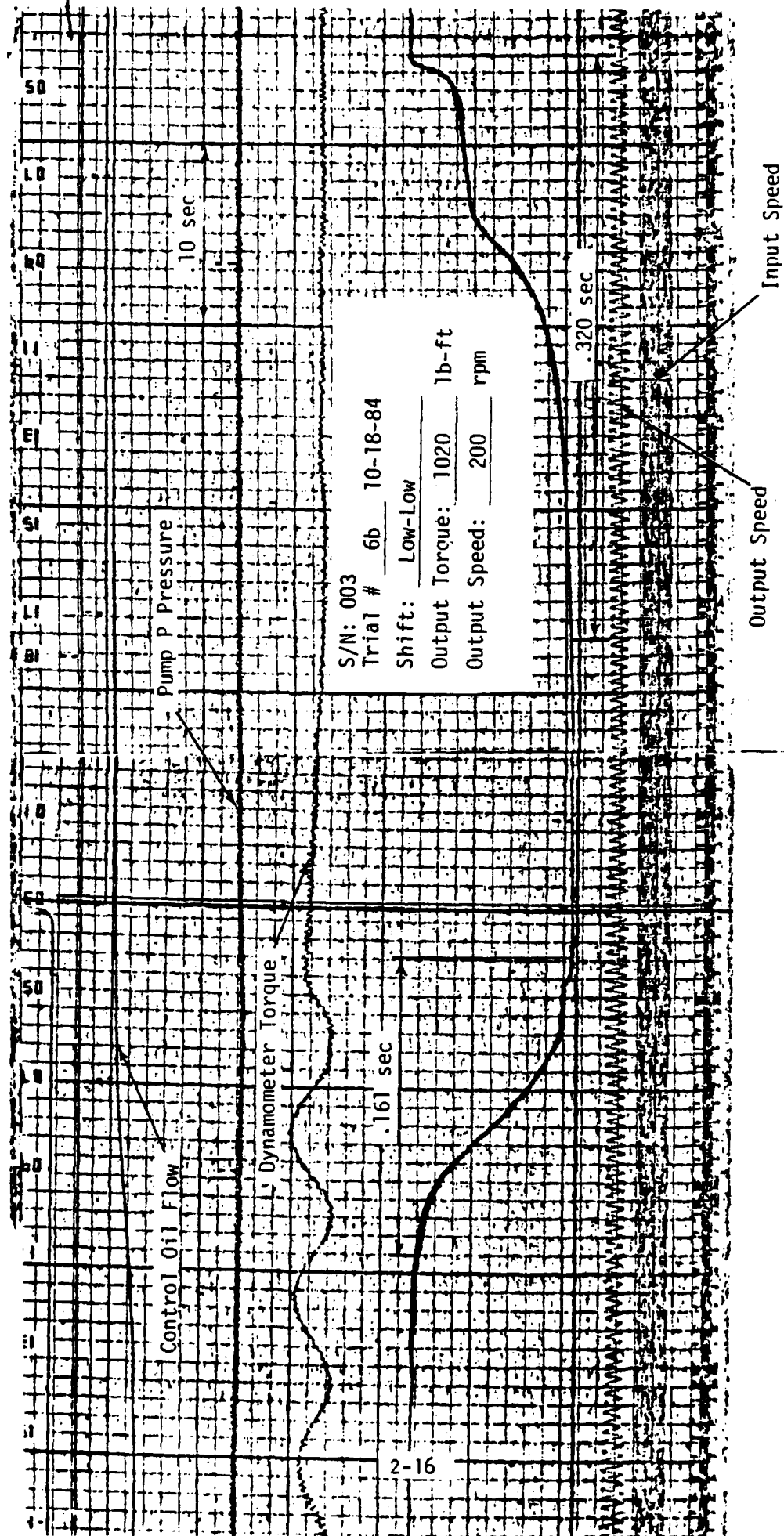


Figure 12.



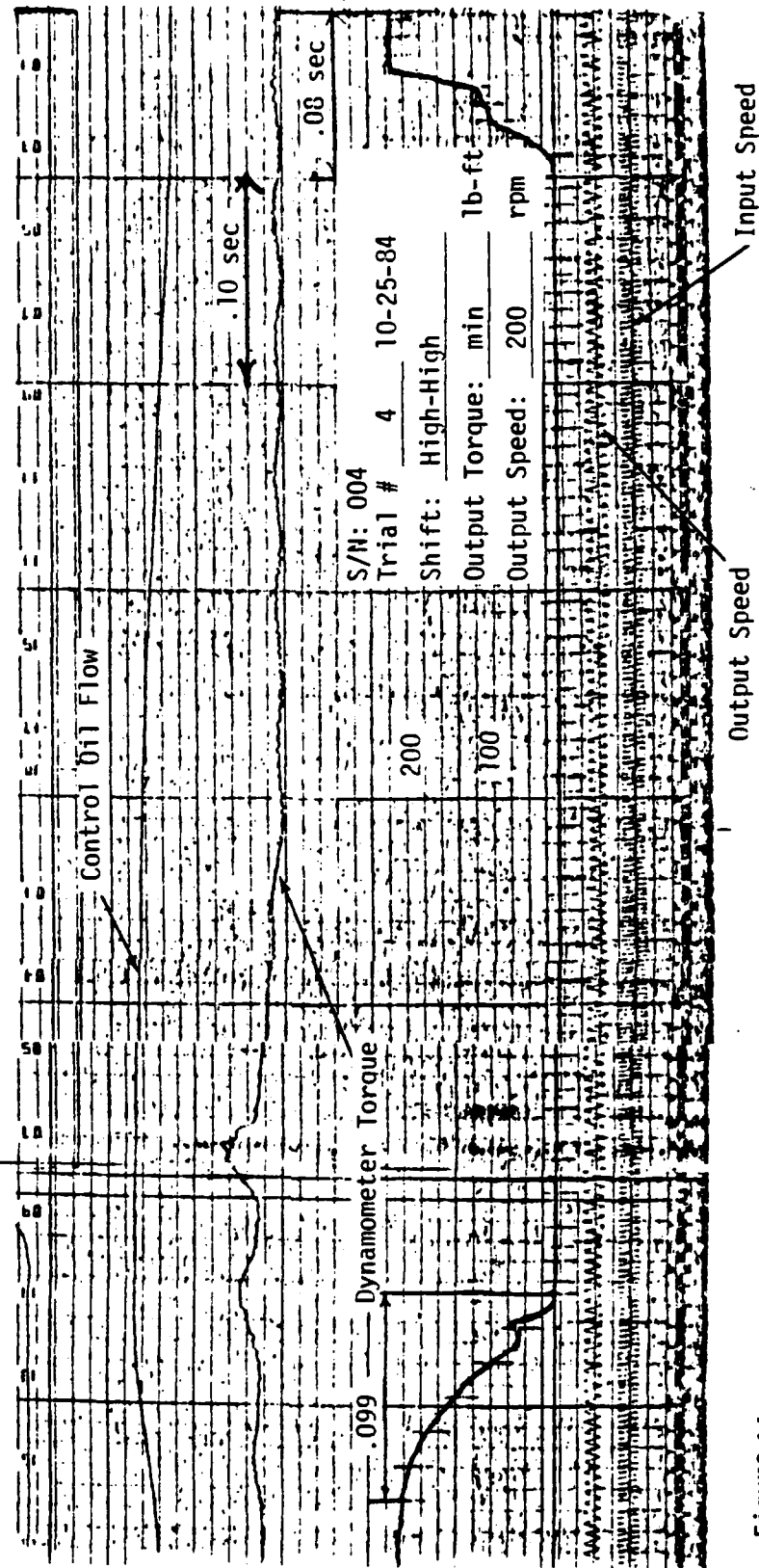


Figure 14.

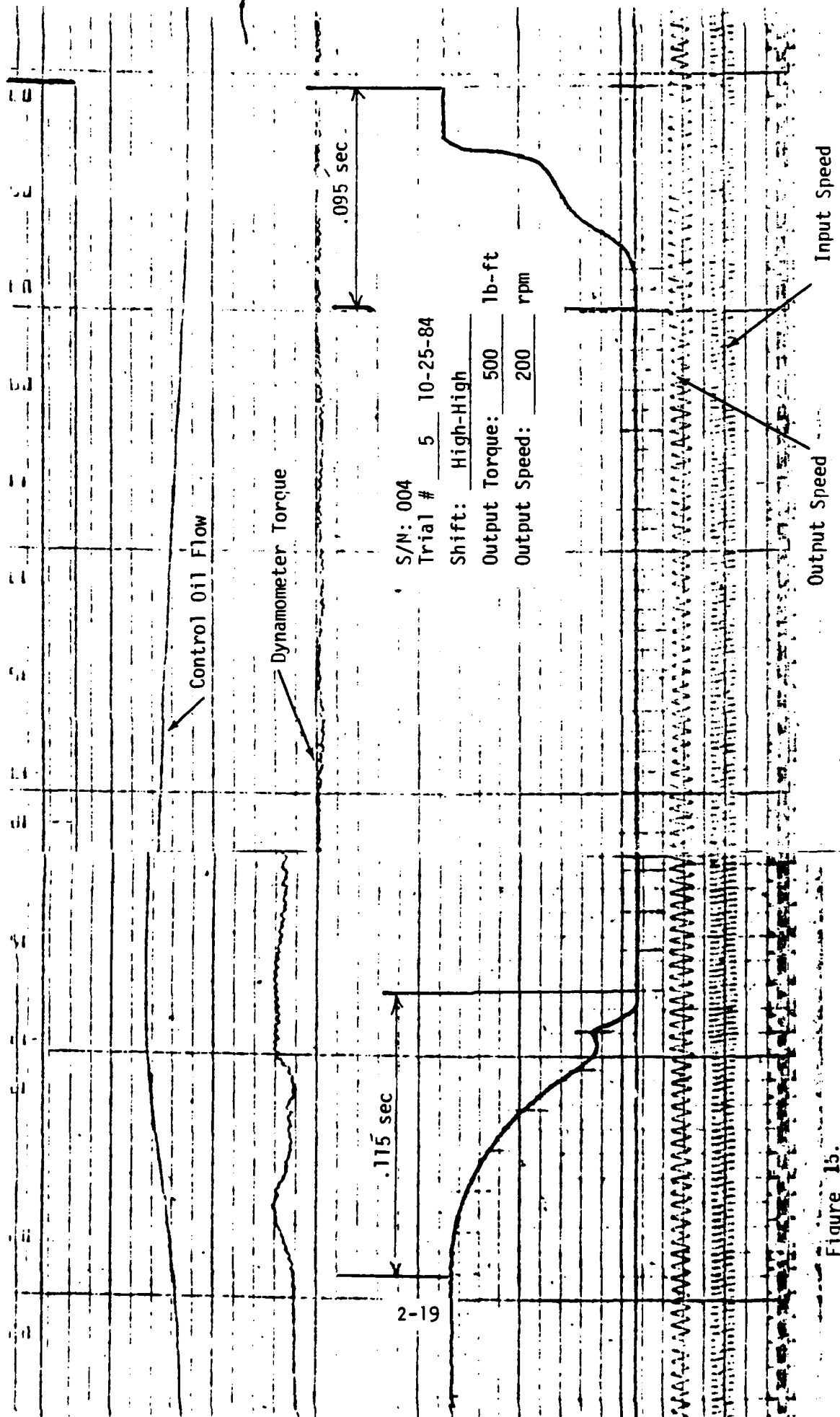


Figure 15.

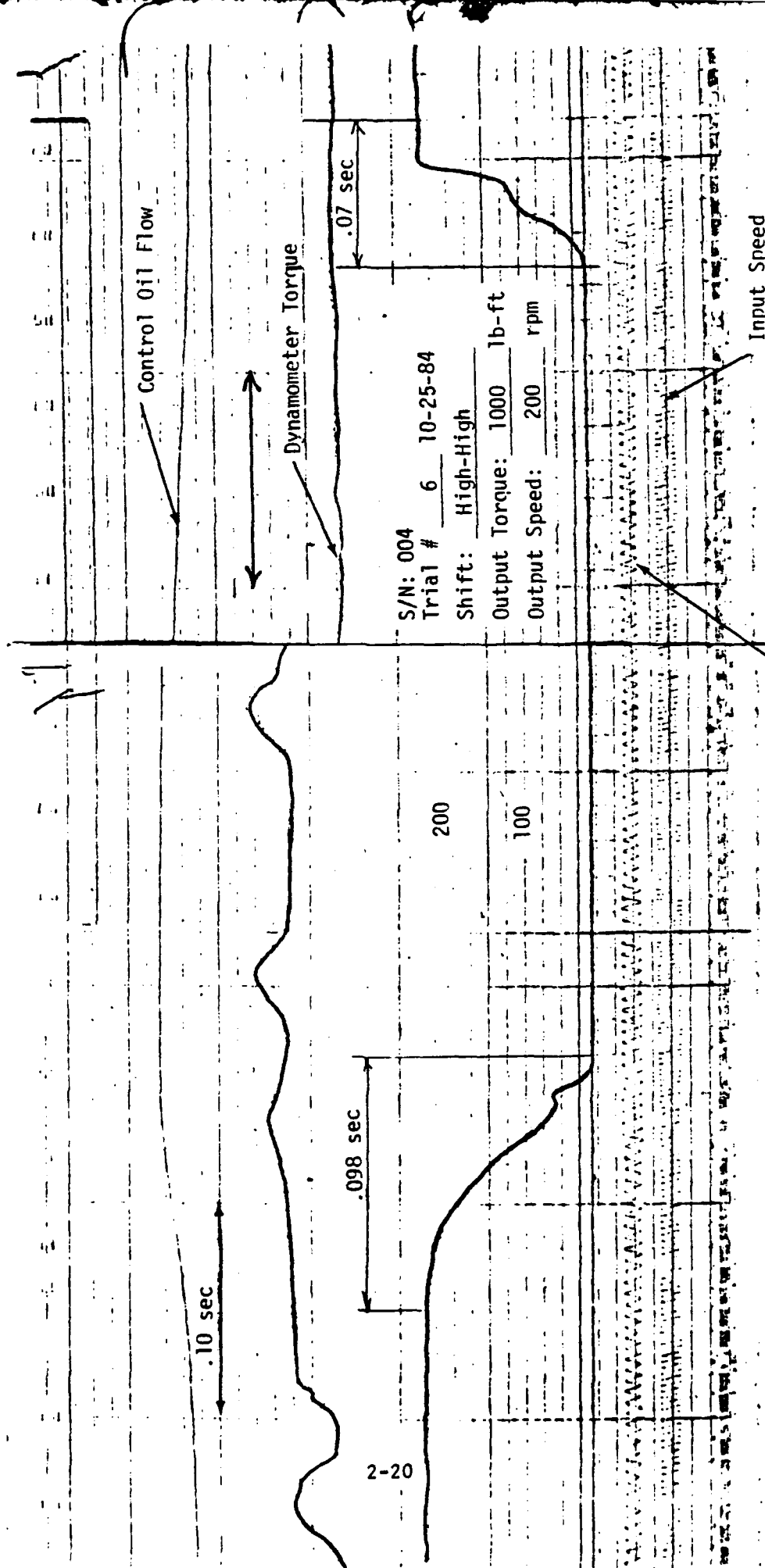
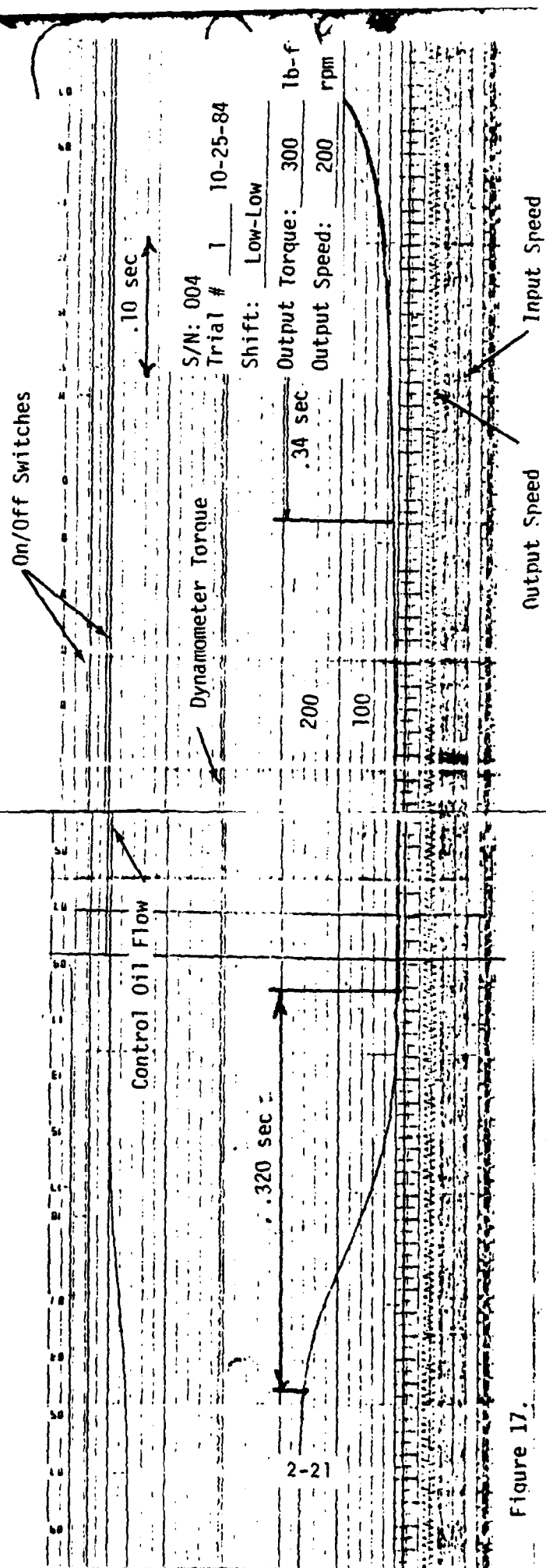


Figure 16.





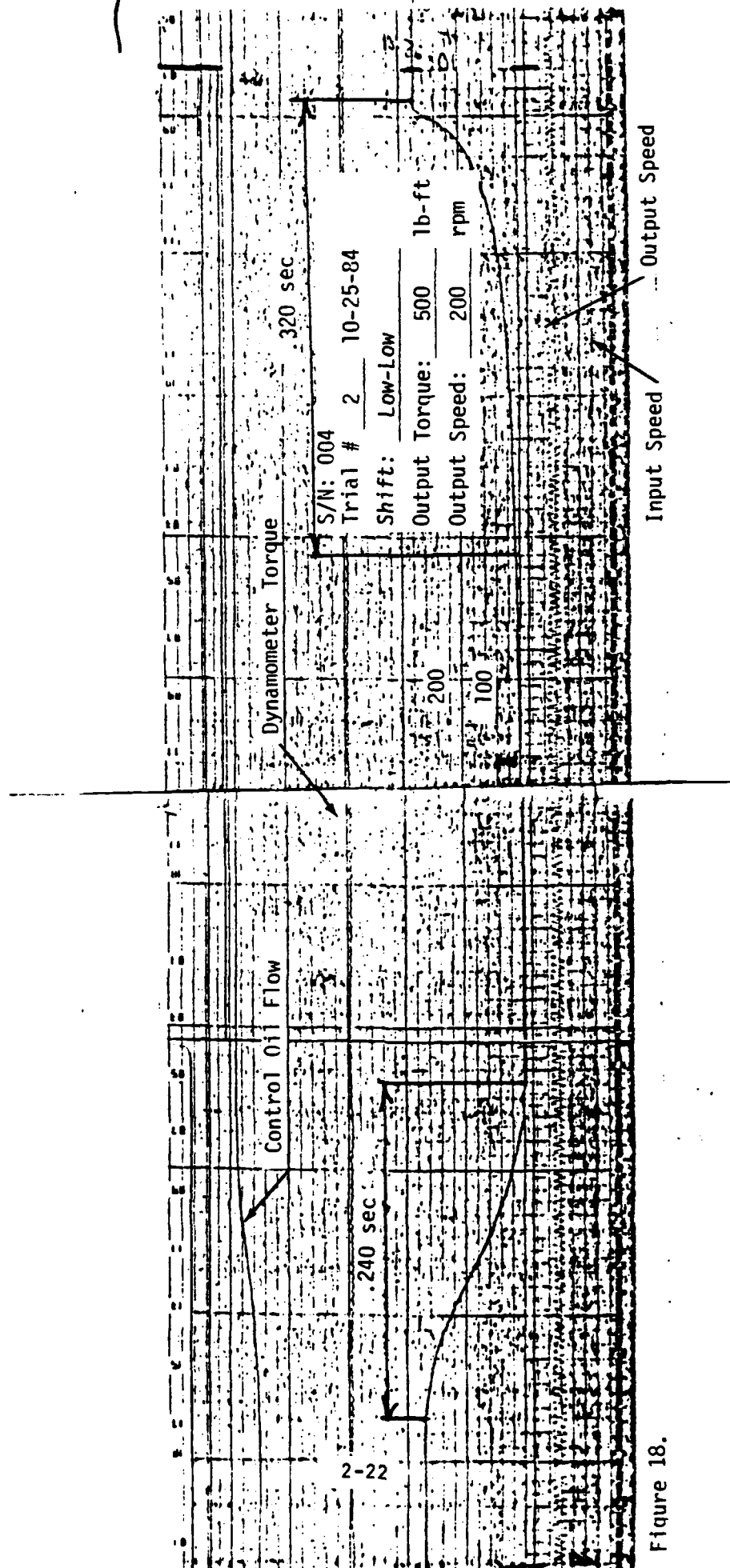


Figure 18.

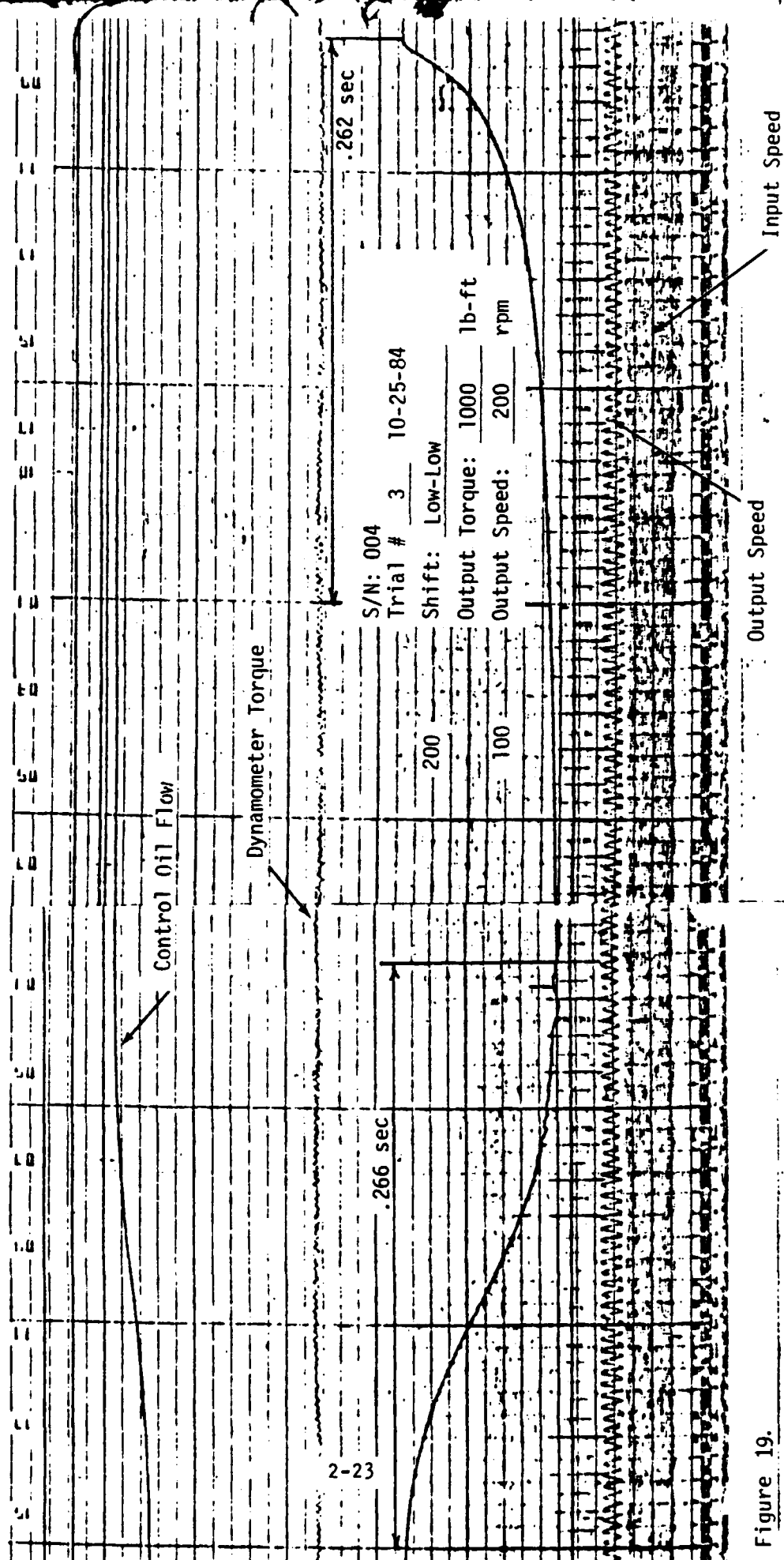


Figure 19.

## 2.2 Task 2

### Disassembly and Inspection of Final Drive

Final drive S/N 3 was disassembled after 20 hours of tests which included shifting of clutches under various loads.

All gears, splines, bearings, clutch plates, brake plates, and other wearing parts were inspected for wear, overheating and other signs of problems.

Two problem areas were discovered:

- o The input bevel gear outer bearing had indications of overheating due to lack of lubrication. See Photograph No. C-12156.

Modifications to improve lubrication to this bearing were made to the bevel gear and bevel gear bearing carrier on all four final drives. Modifications to the parts are shown on photographs C-12155, 58 and 59.

- o The brake plates showed signs of overheating and wear from lack of lubrication. During testing of the final drive the lubrication supply dropped below the minimum design requirements of .7 GPM leading to damage to the plates. Photograph No. 86336 shows the comparison between a new set of plates and the plates removed from the final drive.

To validate that the failure modes noted in final drive S/N 3 have been resolved the following effort was accomplished:

- o Input Bevel Gear Bearing

Final drive S/N 4 was modified for improved lubrication to the bearing prior to the start of its 20 hour test. After the test was completed the bearing was inspected and found to have no indication of lubrication problems. The cavity where the bearing is mounted was well lubricated and no signs of overheating was observed.

- o Brake Plates

Final drives S/N 1 and 2 brakes were inspected after 20 hours of tests and were found not to have the problem noted in S/N 3.

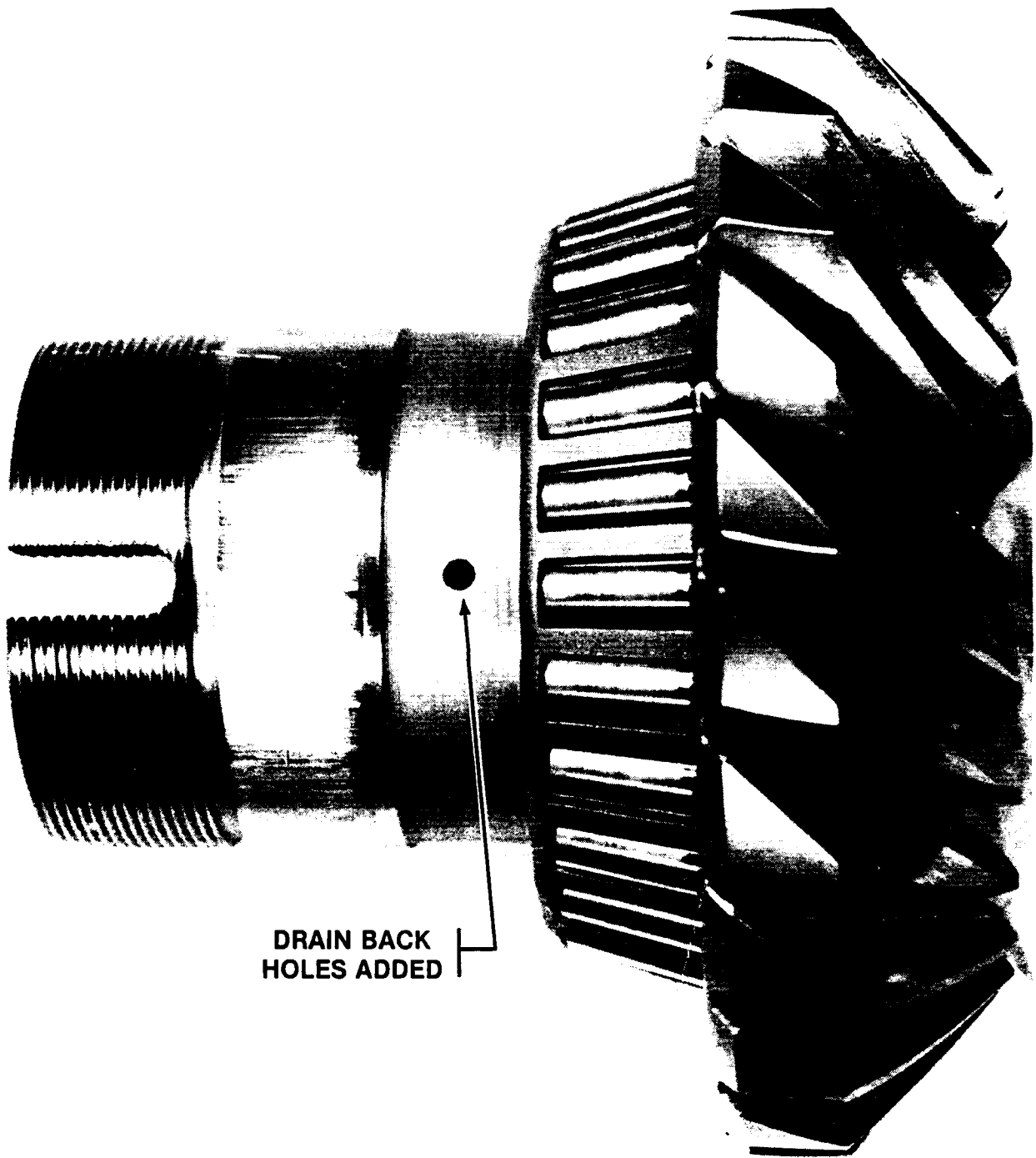
Final drive S/N 4 brakes were inspected after 20 hours of tests including no load brake dynamic tests. Oil flow to the brakes were monitored to insure design requirements were met. Inspection revealed the plates were well lubricated and no sign of overheating was noted.

FMC



C-12156

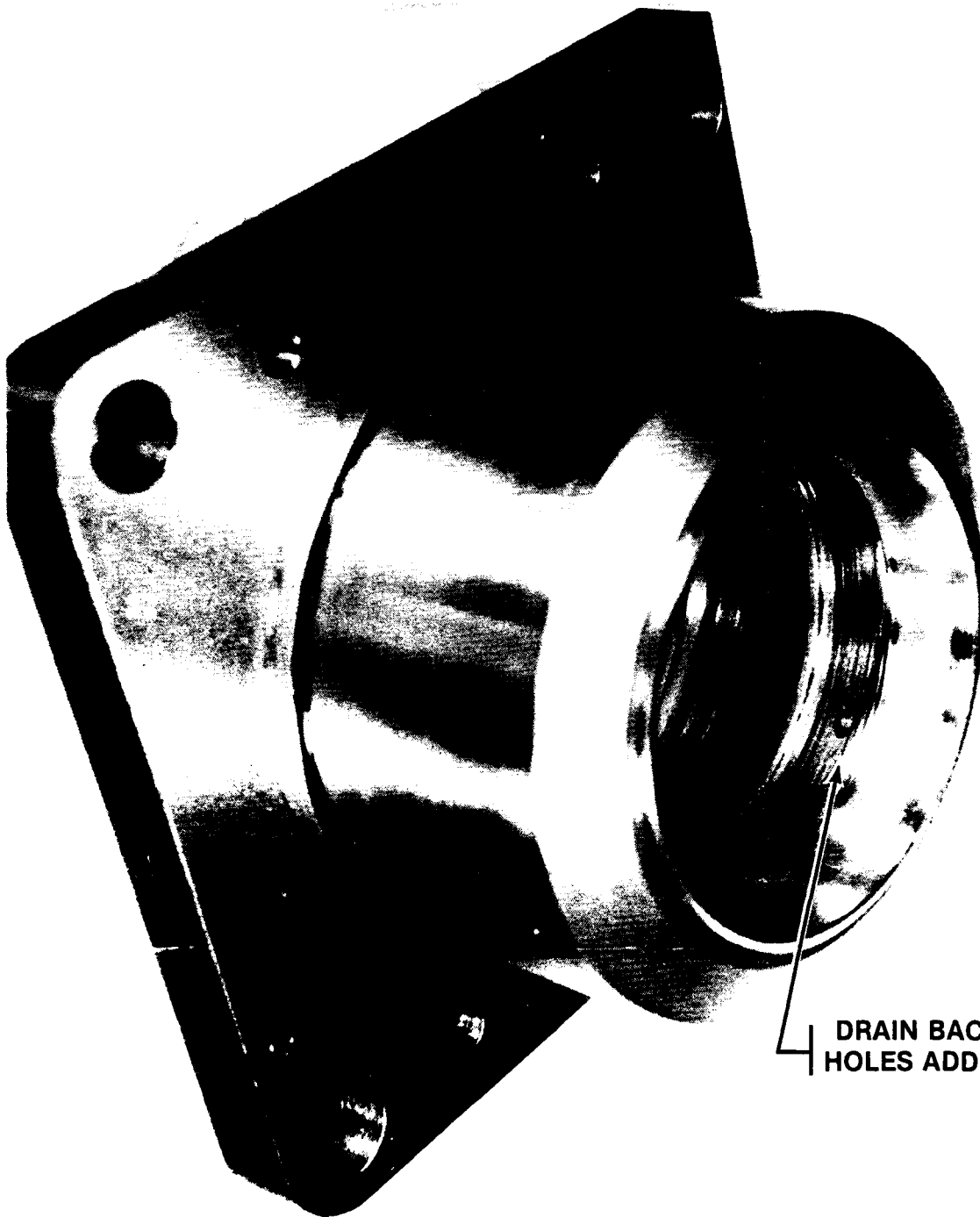
FMC



DRAIN BACK  
HOLES ADDED

C-12155

FMC



DRAIN BACK  
HOLES ADDED

C-12158

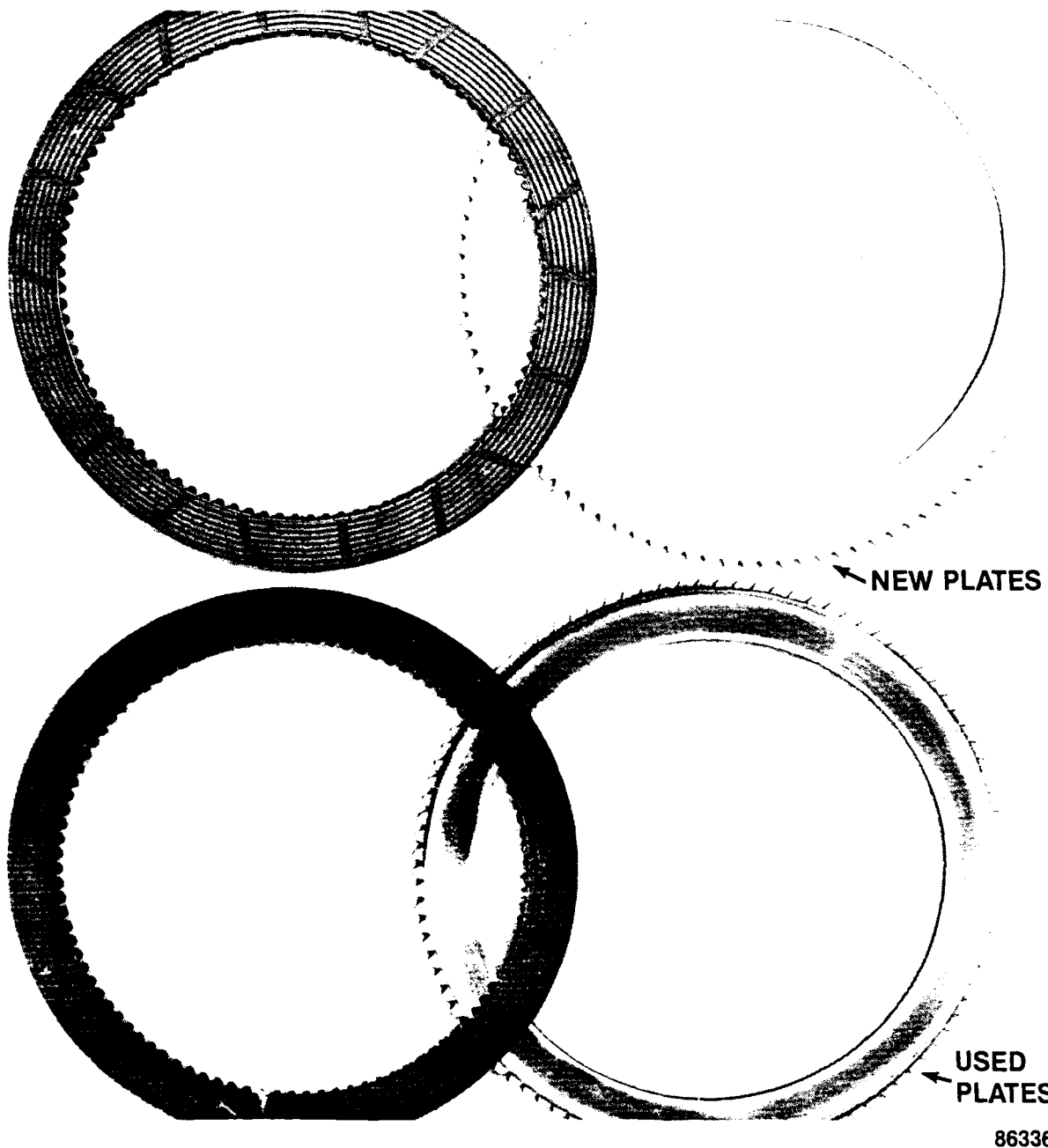
FMC



C-12159



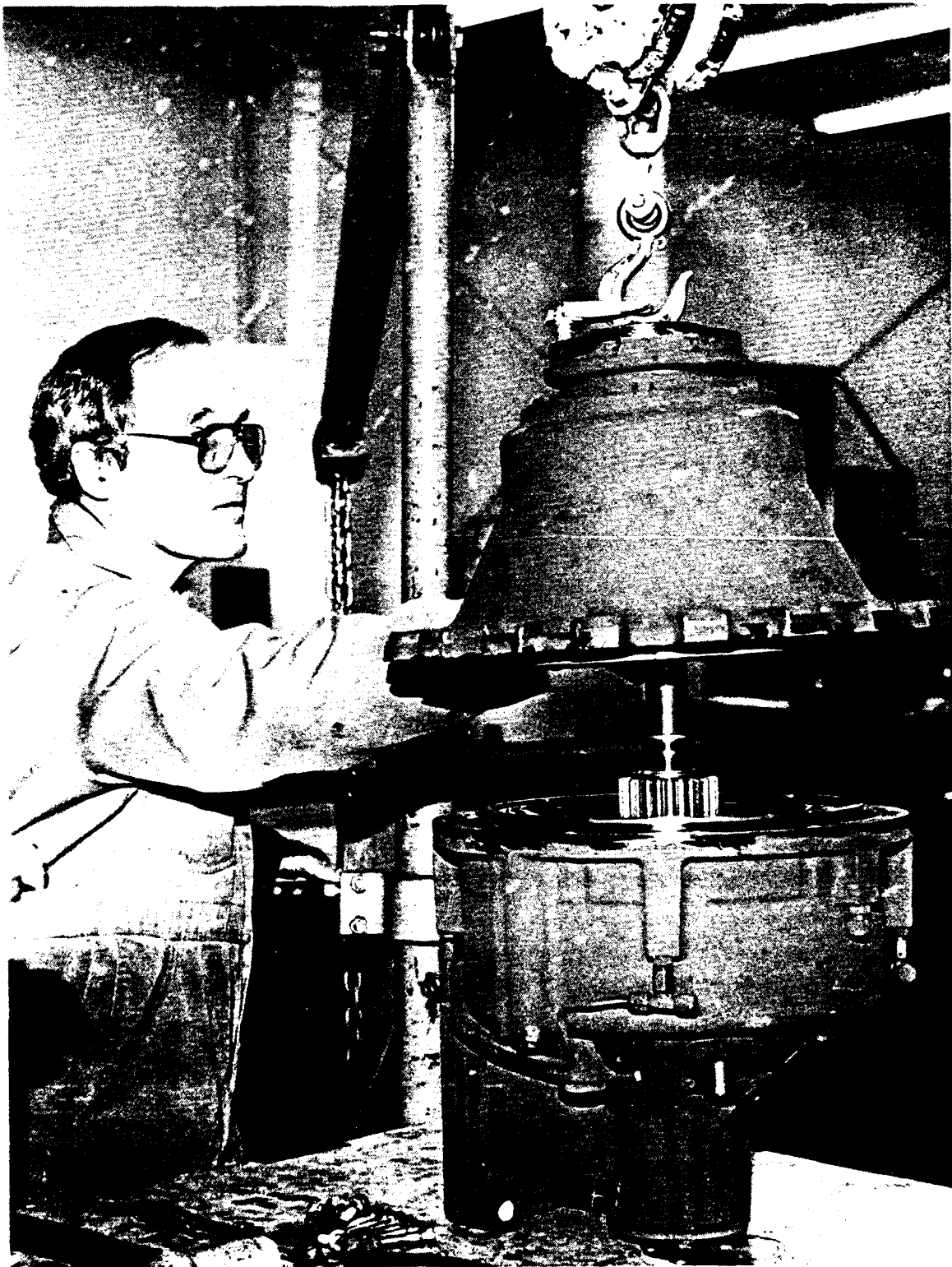
FMC



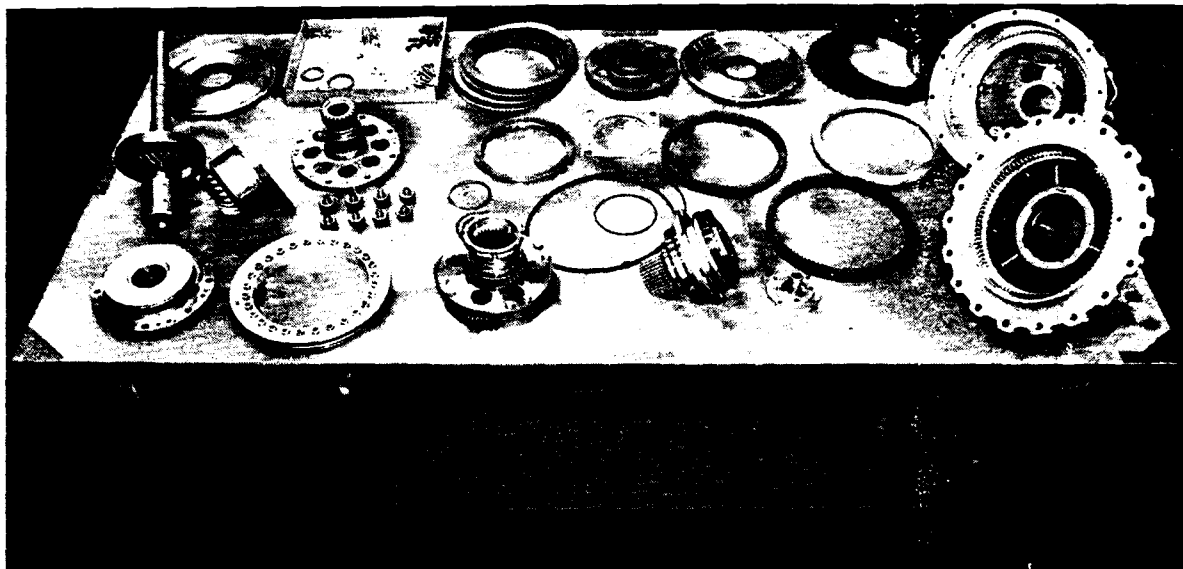
86336

Included in this report are photographs taken of the other component parts which were inspected. No problems were evident. Identification of the photographs are noted below.

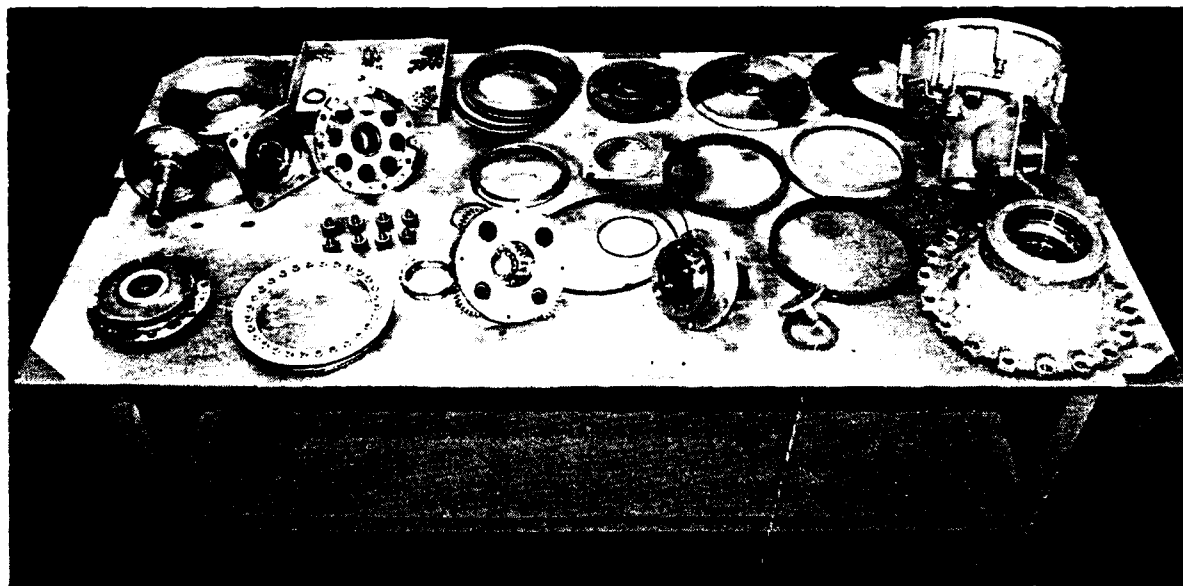
<u>Photo No.</u>	<u>Description</u>
86350	Start of disassembly
85334 85335	Display of all the disassembled parts
85343	View of the input housing, looking at the splines
85344	Input housing showing input mounting flange
86341	Output housing looking at the splines
85342	Output housing looking at bearing assembly
86337	Matched bevel gear set
85338	High speed clutch housing and bevel set input bearing carrier
86340	Output shaft assembly
86351	High speed clutch assembly Piston right side of photo Driver, driven, and plates of clutch left side of photo
86345	High speed input planetary assembly showing planet gears
86346	High speed planetary assembly view of output portion of carrier
86347	High speed planetary assembly showing both sections of the carrier
86348	Brake hub with plates installed
86349	Brake assembly with hub, plates and reaction member
86339	Low speed output planetary assembly



Start of disassembly

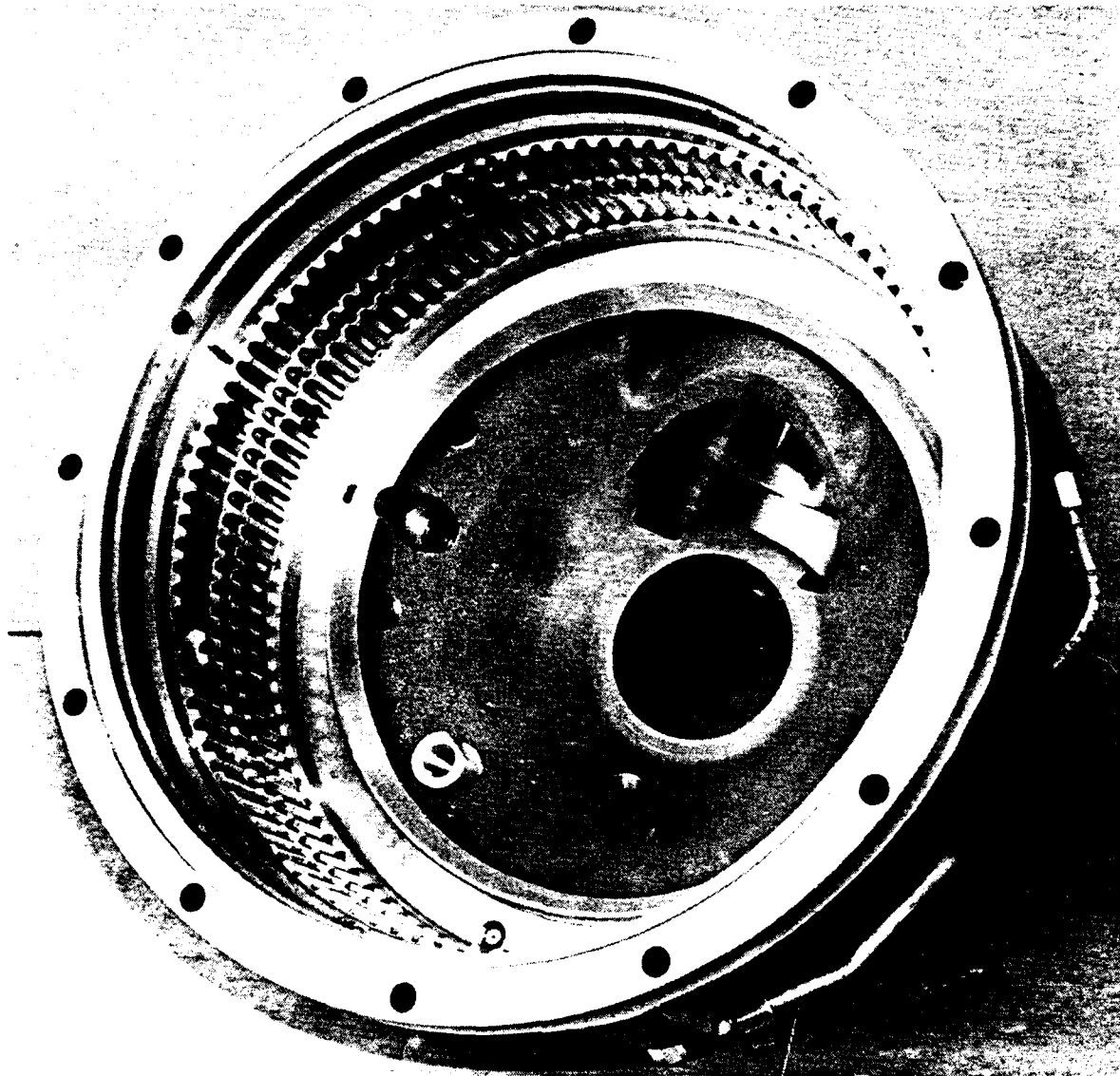


86334



86335

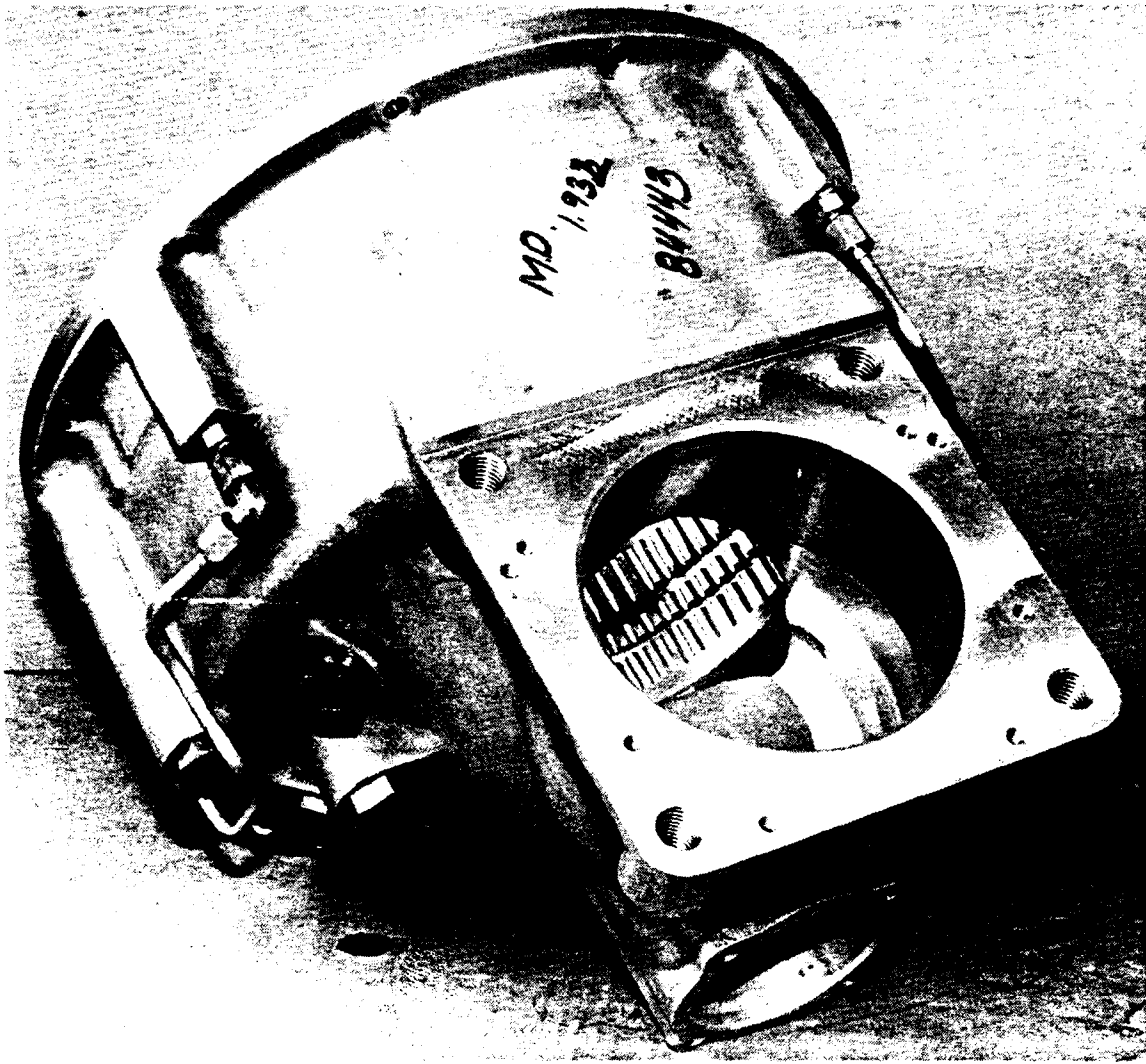
Display of all the disassembled parts



86343

View of the input housing, looking at the splines

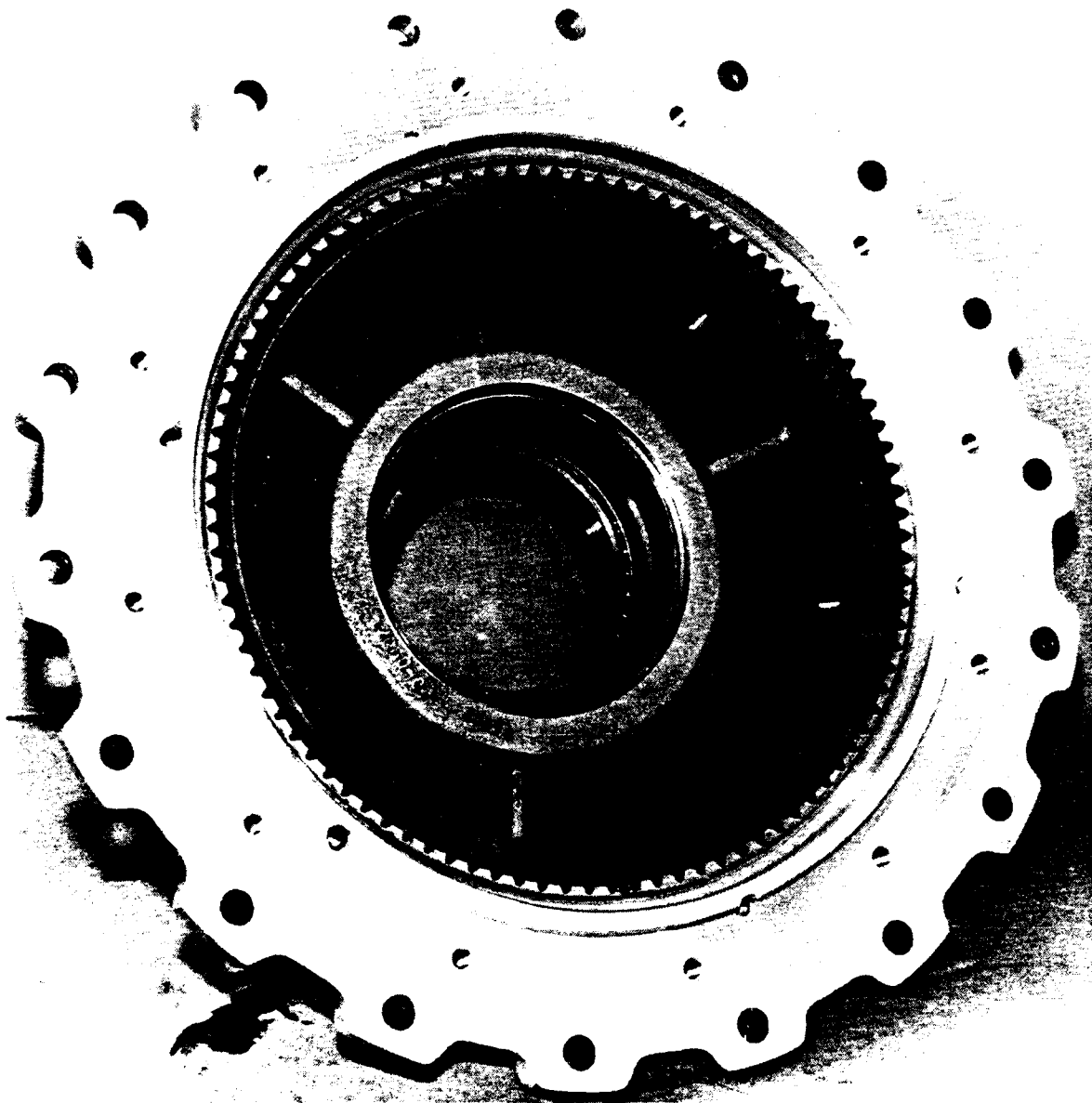
FMC



86344

Inner housing showing input mounting flange

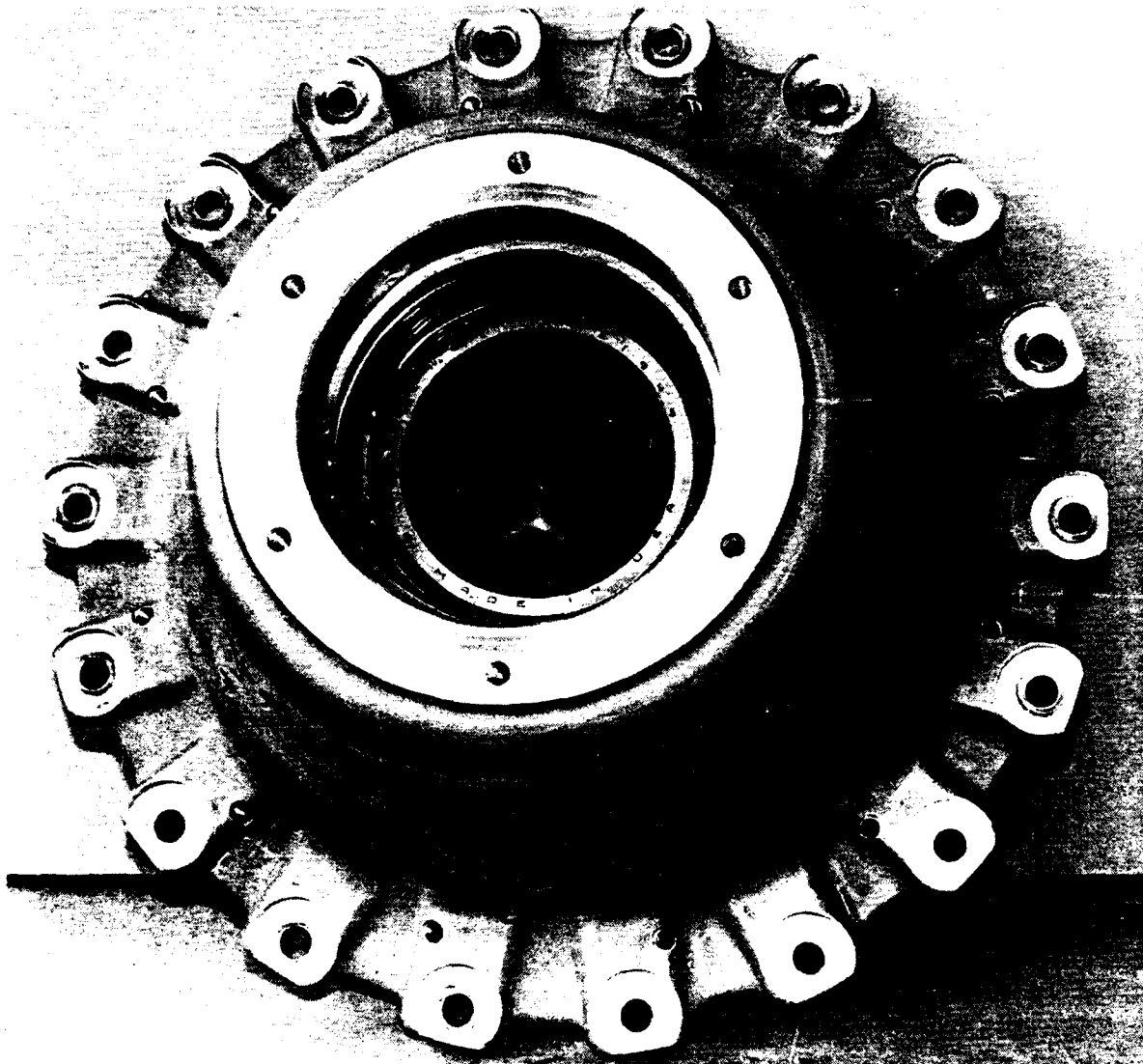
FMC



86341

Output housing looking at the splines

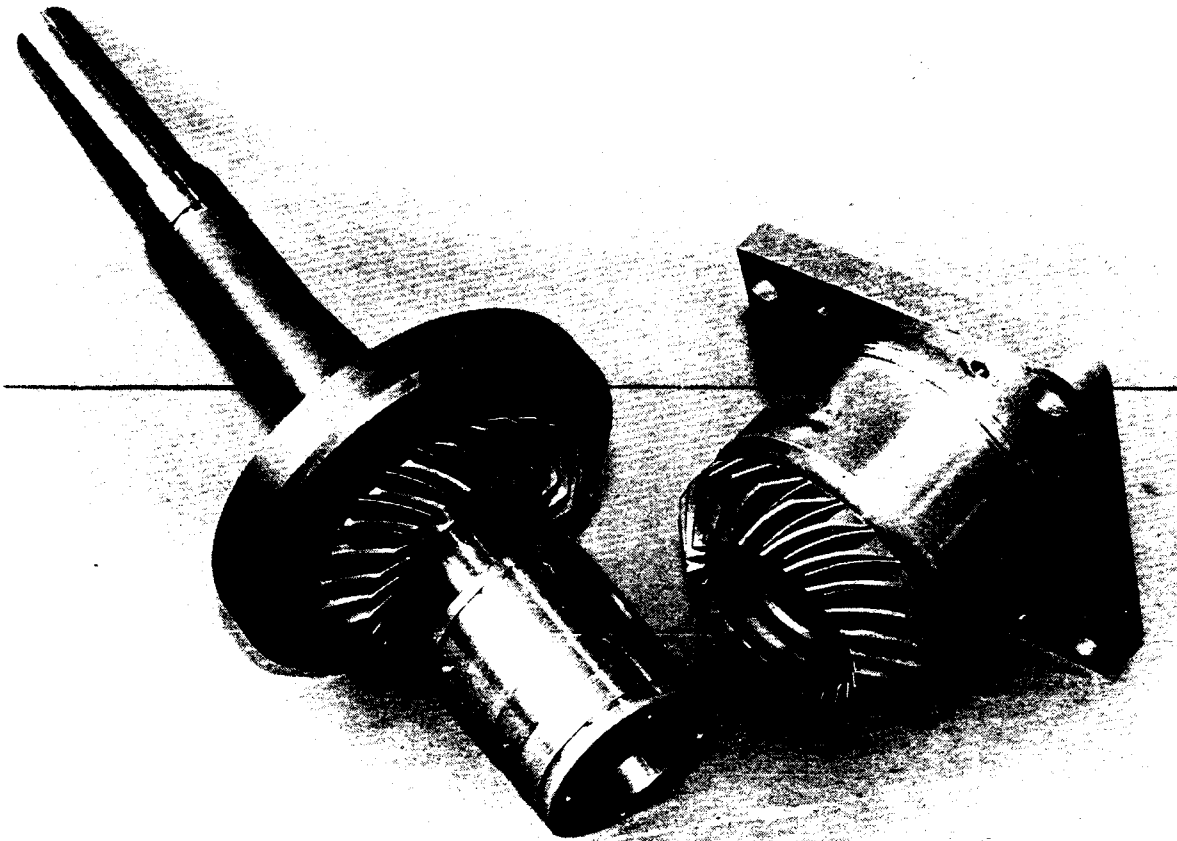
FMC



86342

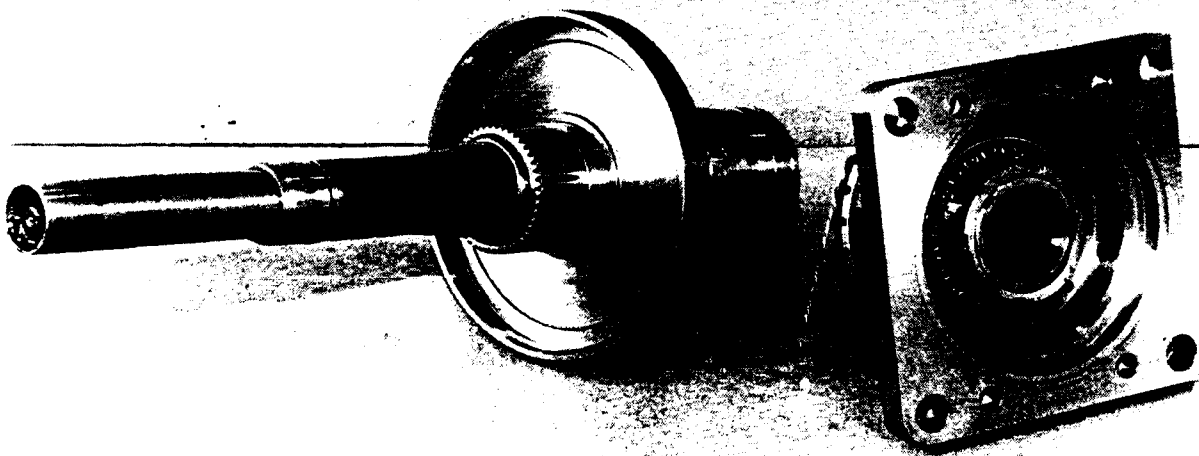
Output housing looking at bearing assembly





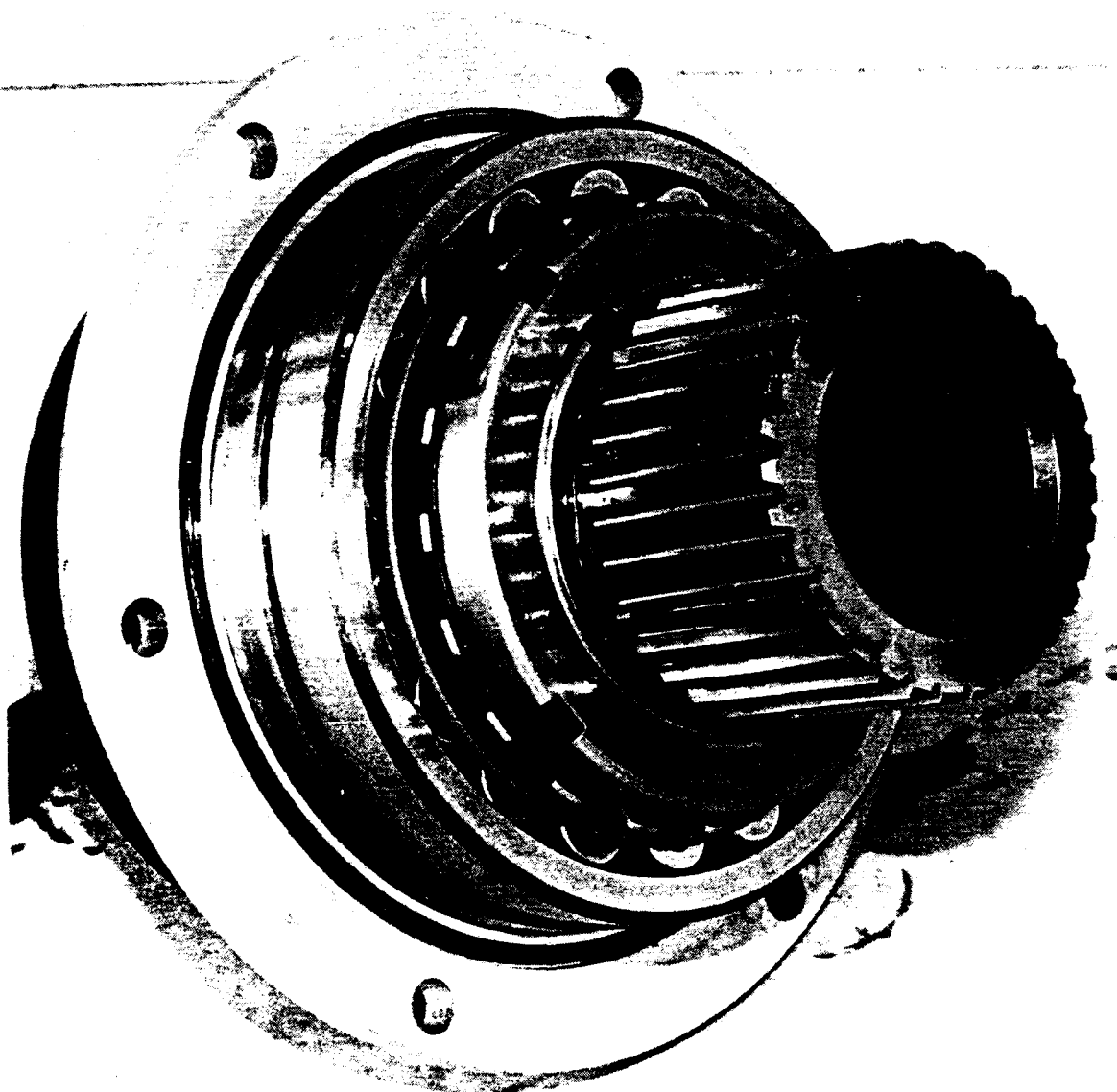
Matched bevel gear set

86337



86338

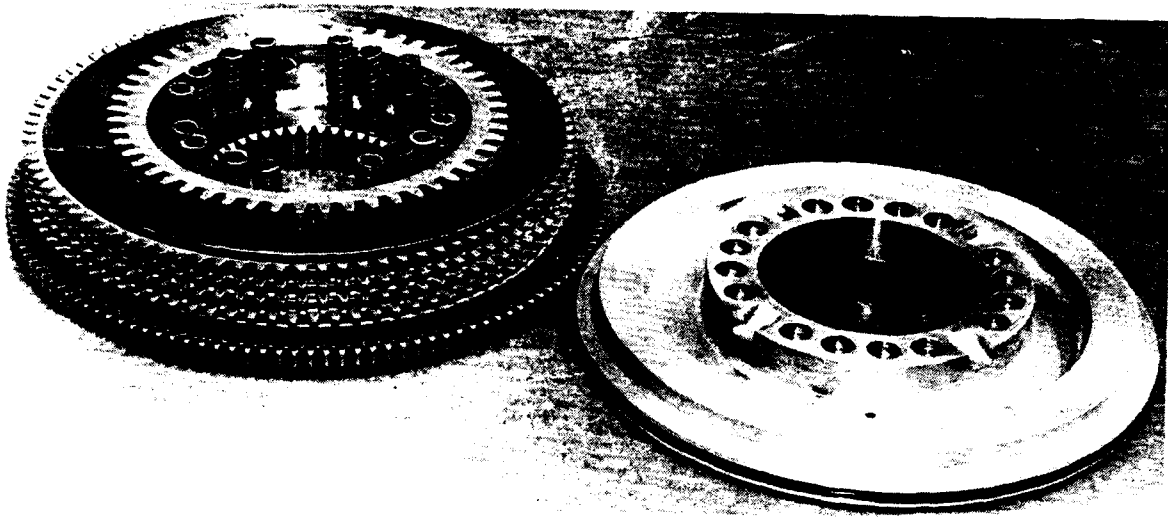
High speed clutch housing and bevel set input bearing carrier



86340

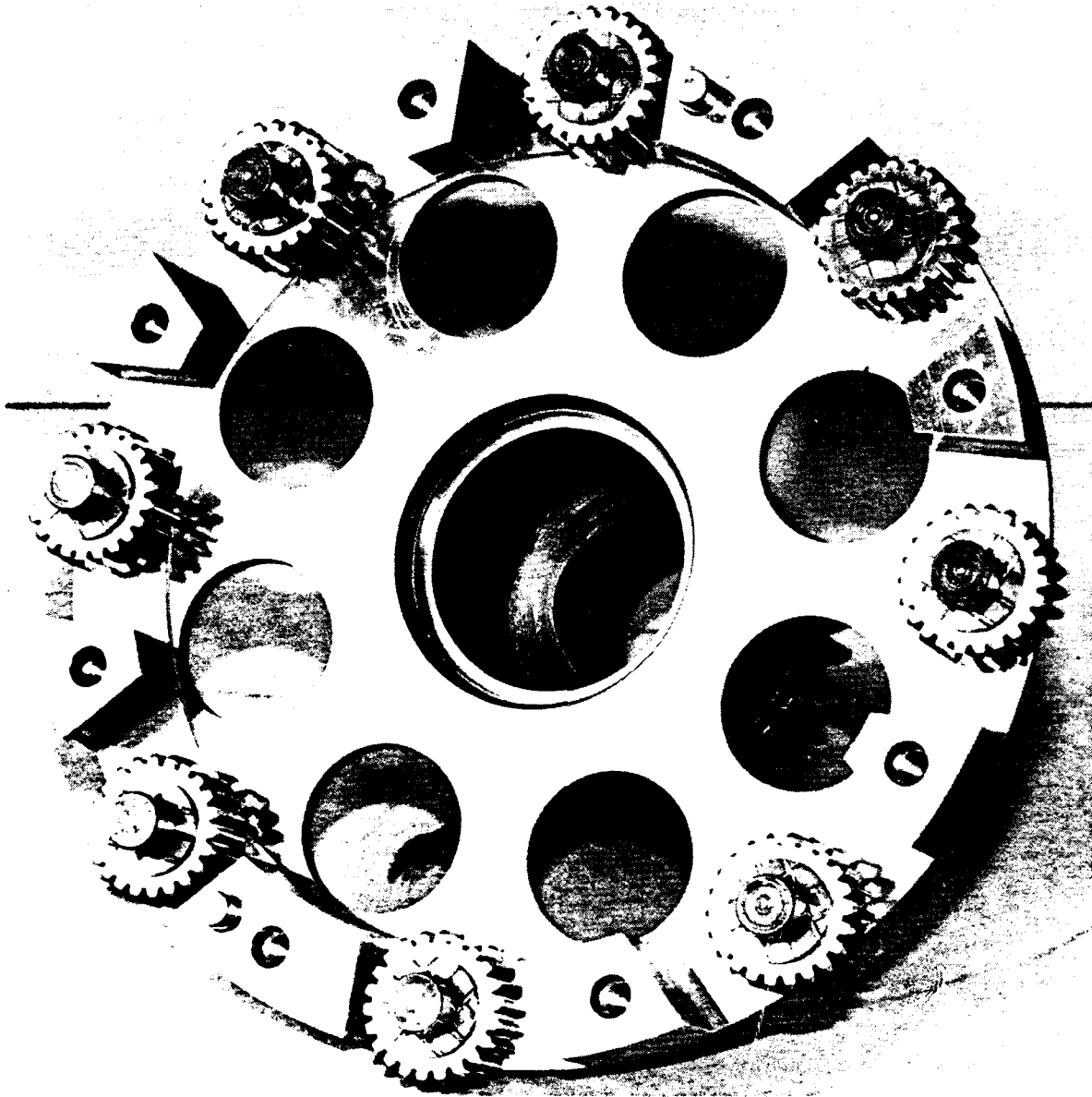
Output shaft assembly

FMC



86351

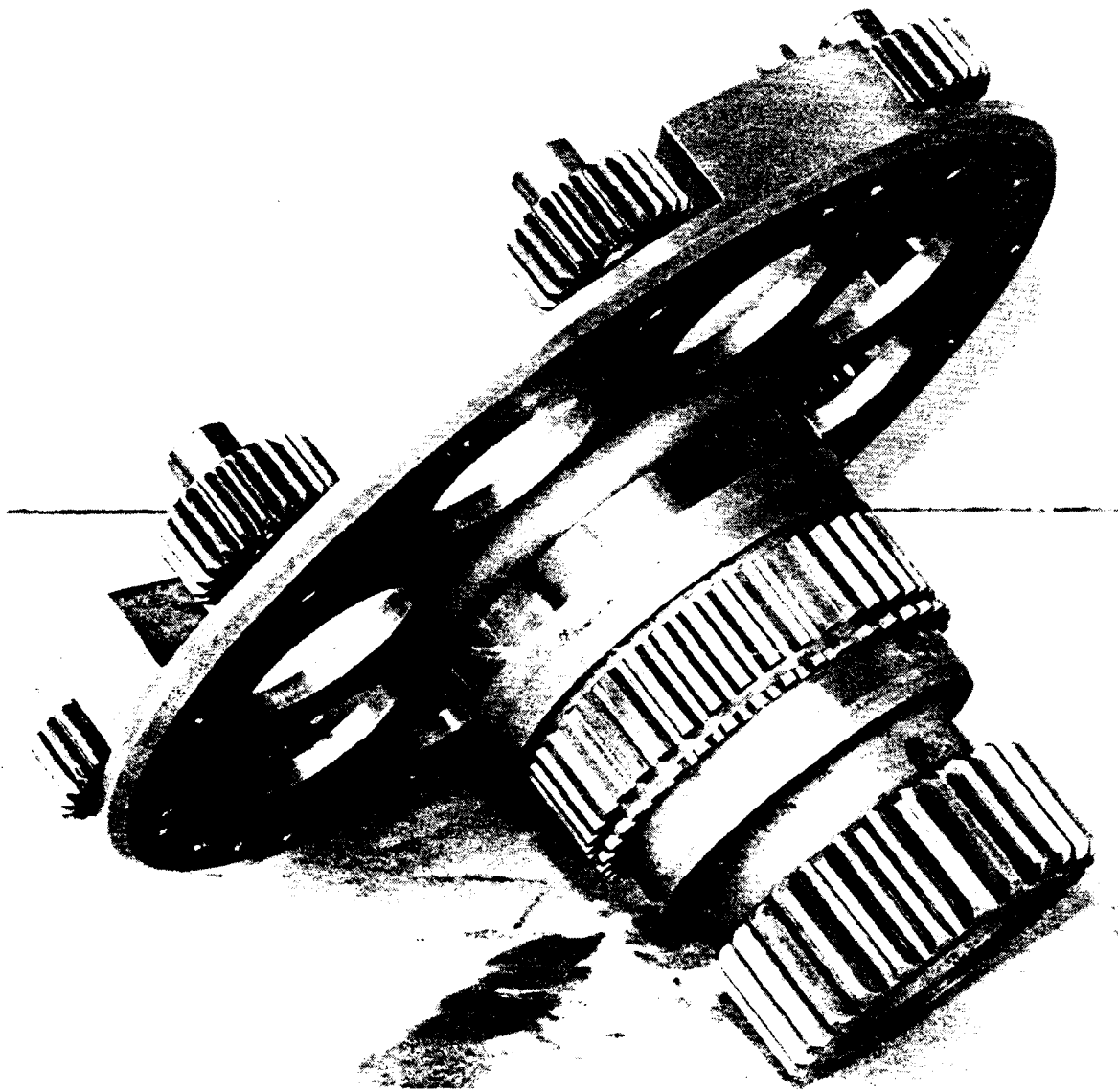
High speed clutch assembly



86345

High speed input planetary assembly showing planet gears

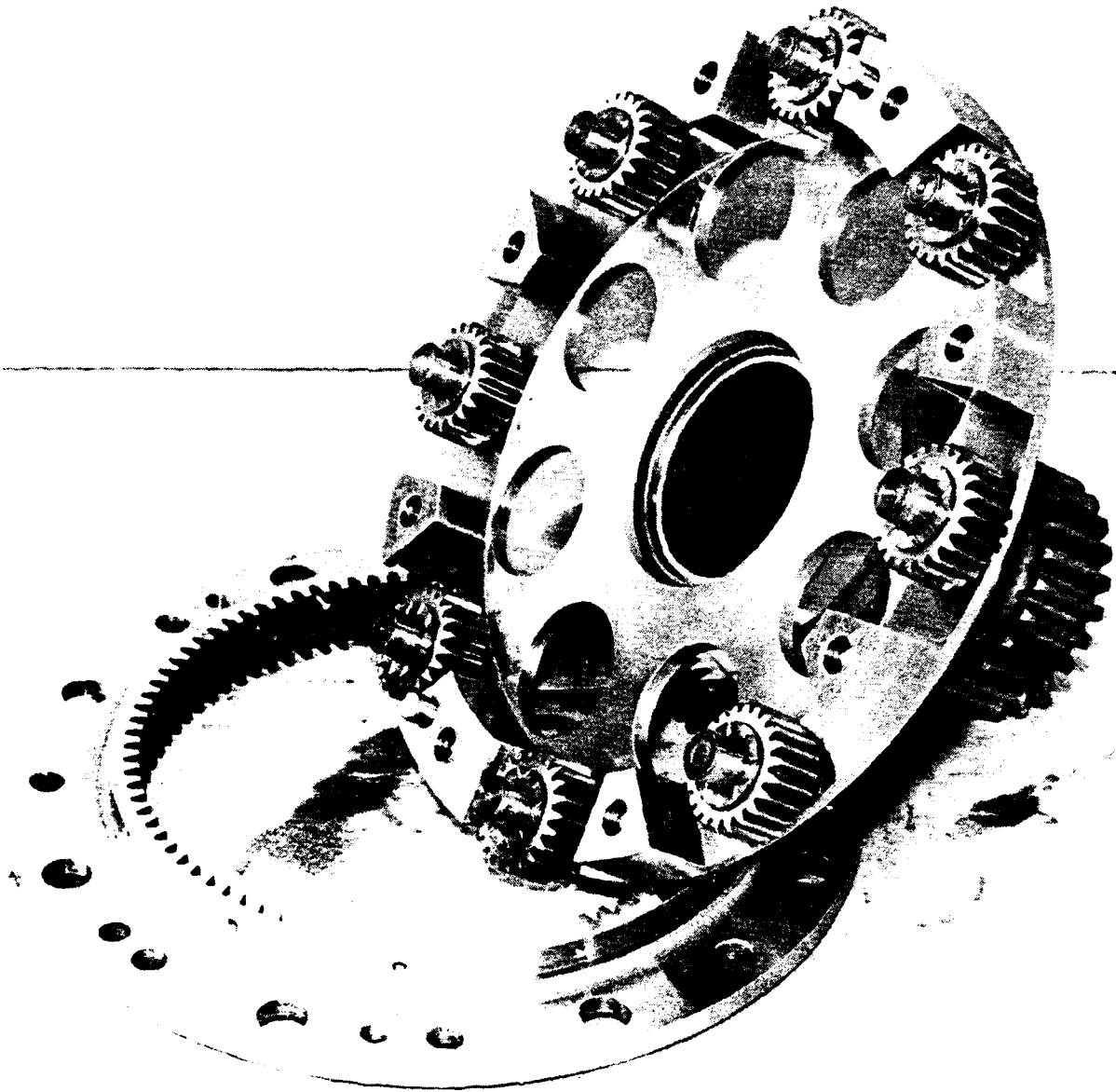
FMC



86346

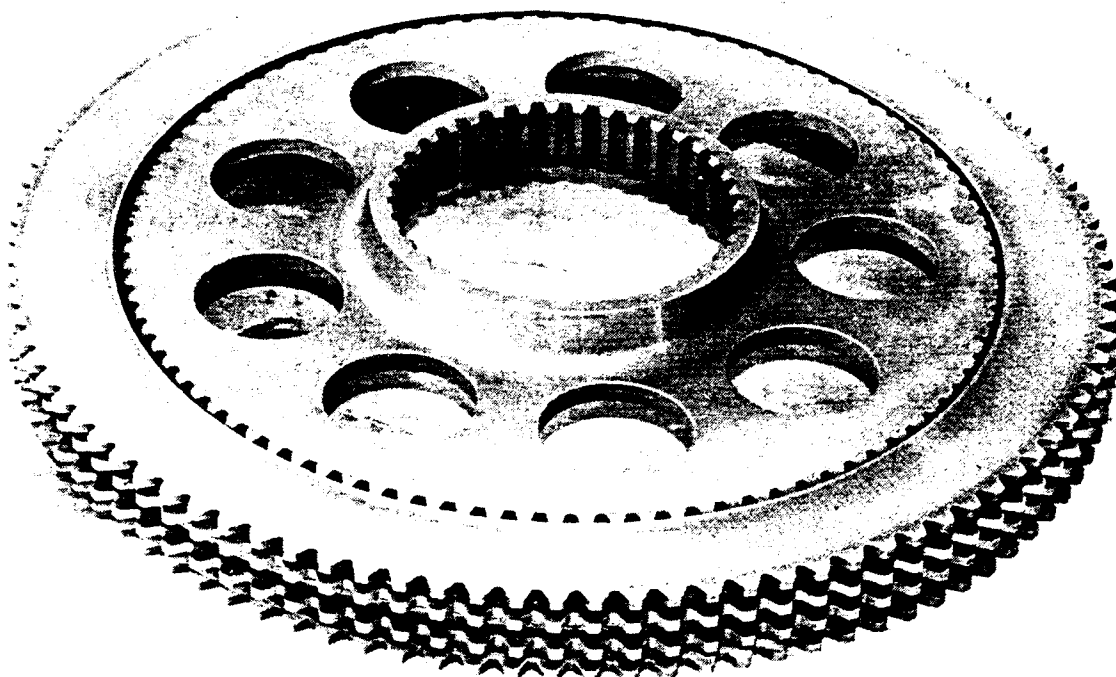
High speed planetary assembly showing both sections of the carrier

FMC



86347

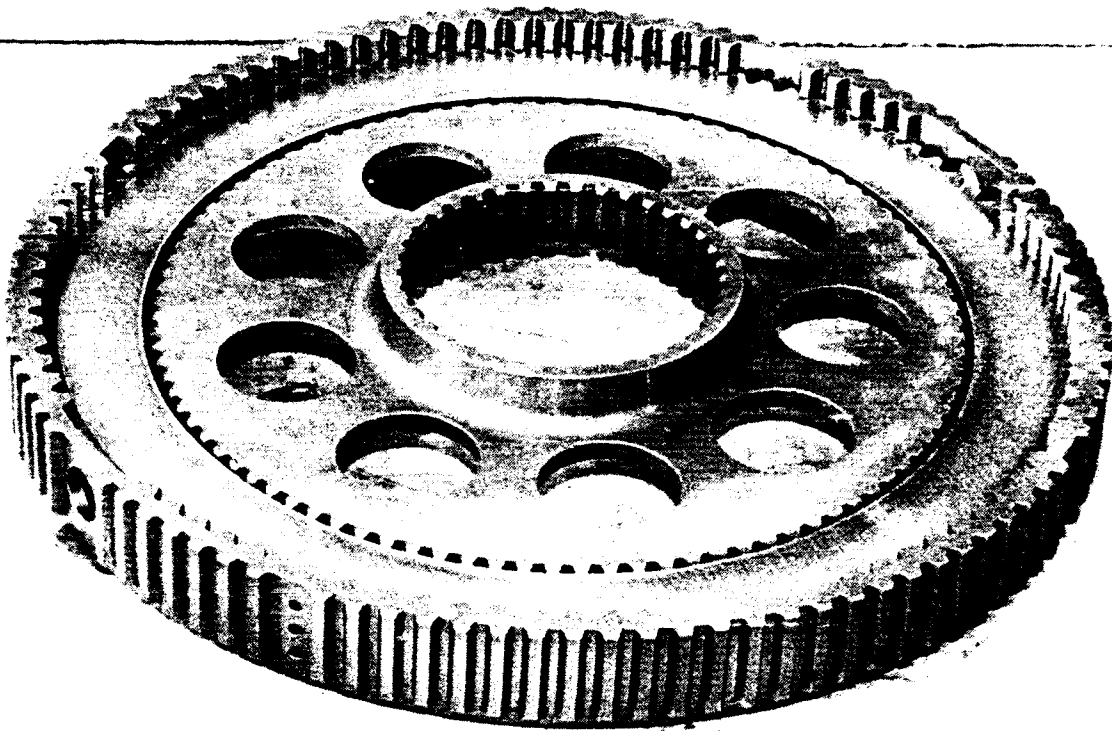
High speed planetary assembly. View of output portion of carrier



86348

Brake hub with plates installed

FMC

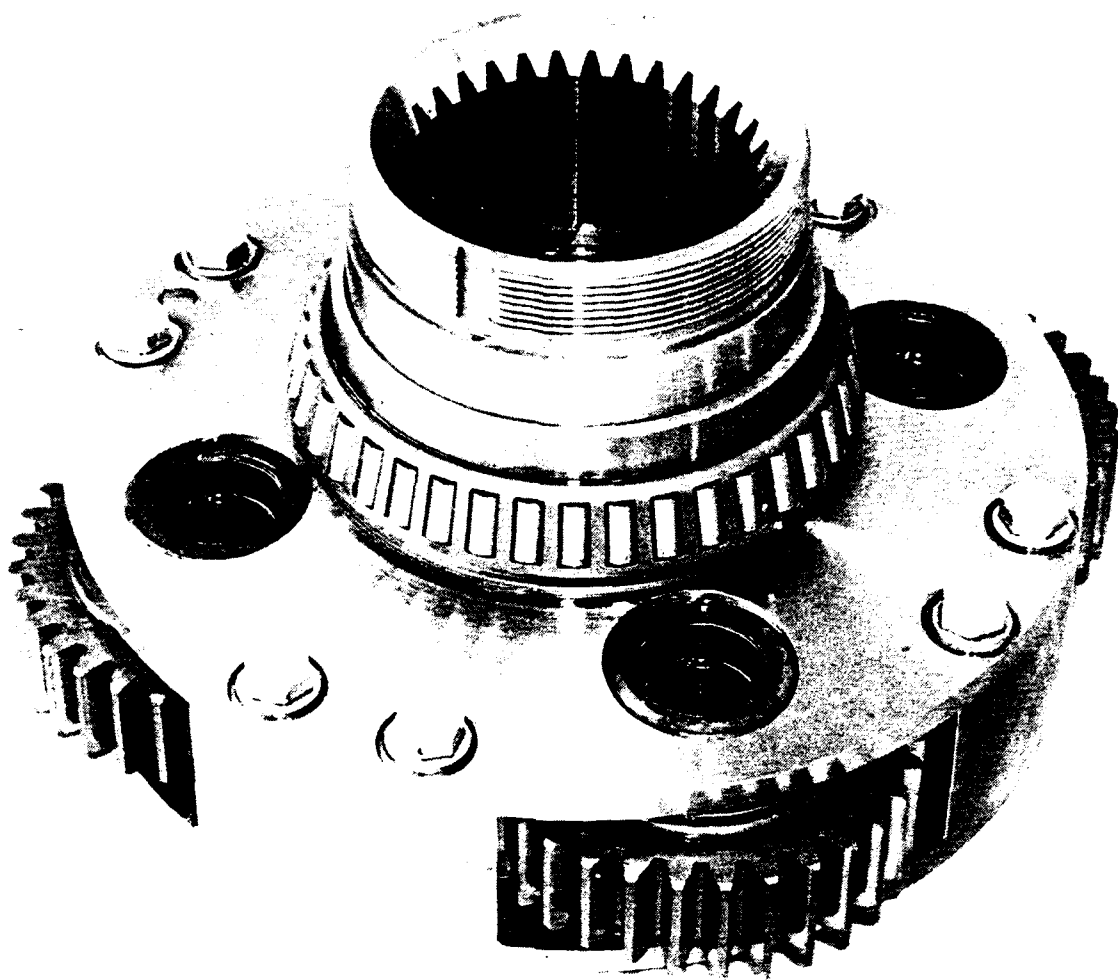


86349

Brake assembly with hub, plates and reaction member



FMC



86339

Low speed planetary assembly

Appendix 3

Test Plan

Test Plan 10130  
Revision B

FUNCTIONAL TEST OF TWO-SPEED EPICYCLIC  
FINAL DRIVES FOR A 14-TON AMPHIBIOUS VEHICLE

Project Authorization 848-100-103

Reference: Test Work Request 583

Contract N00167-83-C-0110

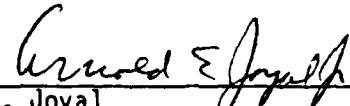
23 August 1984

Ordnance Division (Engineering)  
FMC Corporation  
San Jose, California

Prepared By:

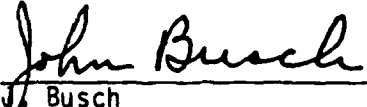
  
N. Barr  
Associate Mechanical Engineer

Approved By:

  
A. Joyal  
Manager, Engineering Test

Reviewed By:

  
R.P. Kaplan  
Manager, Product Safety

  
J. Busch  
Assistant Chief Engineer

1. INTRODUCTION

A two-speed, power shift, epicyclic final drive with integral brakes has been designed to improve the performance of a hydrostatic transmission. The two-speed final drive will increase maximum torque at low speed and maximum output speed beyond the capability of a single speed final drive. The final drives are for use on microprocessor controlled variable displacement hydrostatic and electric drive trains for 14-ton amphibious vehicles being developed by the David Taylor Naval Ship Research and Development Center (DTNSRDC). This program is exploratory development and not a production program.

2. PURPOSE

The purpose of this test is to determine if the four two-speed epicyclic final drives meet the requirements outlined by Contract N00167-83-C-110.

3. SCOPE

The testing of four two-speed final drives will be conducted in the FMC Dynamometer Facility in Plant 7 at San Jose, California. Each final drive will be tested functionally. The functional test is a contract requirement and will be witnessed by DTNSRDC Engineering as government officials at their option and FMC Engineering.

4. TEST PROCEDURE

The test will be set up as shown in Figure 1 of this test plan. The final drive and reservoir will contain MIL-L-2104 grade 30 oil.

Operate each final drive on a dynamometer for a minimum of 20 hours, without any failures. Operation does not have to be continuous. The test will be conducted with an ambient temperature of  $80 \pm 10^{\circ}\text{F}$ . The maximum input oil temperature will be  $180^{\circ}\text{F}$ . Static oil pressure will be maintained at 10 psig maximum. Control oil pressure will range from 280 psig to 310 psig.

- 4.1 Measure and record output torque and speed. Torque, speed and horsepower will correspond to the values given in Table 1 and Figure 2. Adjust the output torque to maintain the specified percentage of rated power for a given output speed.

Table 1. Functional Test Cycle for 2-Speed Final Drives

Percentage of Rated Power	Rated Power HP	Hours		Output Speed, RPM	Output Torque lb-ft
		Fwd.	Rev.		
0	0	2.5	2.5	100 to 790	No Load
25 $\pm$ 2%	29 - 34	3.5	3.5	100 to 790	210 to 1640
50 $\pm$ 2%	60 - 65	2.5	2.5	100 to 790	420 to 3280
75 $\pm$ 2%	91 - 96	1.0	1.0	100 to 790	630 to 4920
100 $\pm$ 2%	123 - 128	.5	.5	100 to 790	840 to 6560

- 4.2 Execute a minimum of 50 upshifts and 50 downshifts. When shifting occurs the output power will not fall in the range specified in Table 1. All shifts will be recorded on a counter. Shifts will be made under a variety of loads. Input speed will be returned to 0 for change in direction; forward/reverse/forward.
- 4.3 Sample the final drive oil at five hour intervals. Analyze the samples for contaminant content at FMC Central Engineering Laboratory.
- 4.4 Monitor the temperature of oil returning to reservoir from the final drive, speed, torque, horsepower and time.

##### 5. SAFETY

Established shop safety procedures and policies will be followed, particularly with regard to guards and shields around rotating components.

S/N \_\_\_\_\_

This sheet is a summarization of the functional test conducted in accordance with this test plan.

PERCENT OF RATED POWER	DIRECTION	ACCUMULATED HOURS	ACTUAL POWER OUTPUT
0	FORWARD		
	REVERSE		
25 $\pm$ 2%	FORWARD		
	REVERSE		
50 $\pm$ 2%	FORWARD		
	REVERSE		
75 $\pm$ 2%	FORWARD		
	REVERSE		
100 $\pm$ 2%	FORWARD		
	REVERSE		
TOTAL HOURS	FORWARD		
	REVERSE		

Accumulated hours are calculated from start/stop times recorded by the computer. Actual power outputs are calculated from the output speed and torque values recorded by the computer.

Total Shifts = \_\_\_\_\_

PTP10130REVA

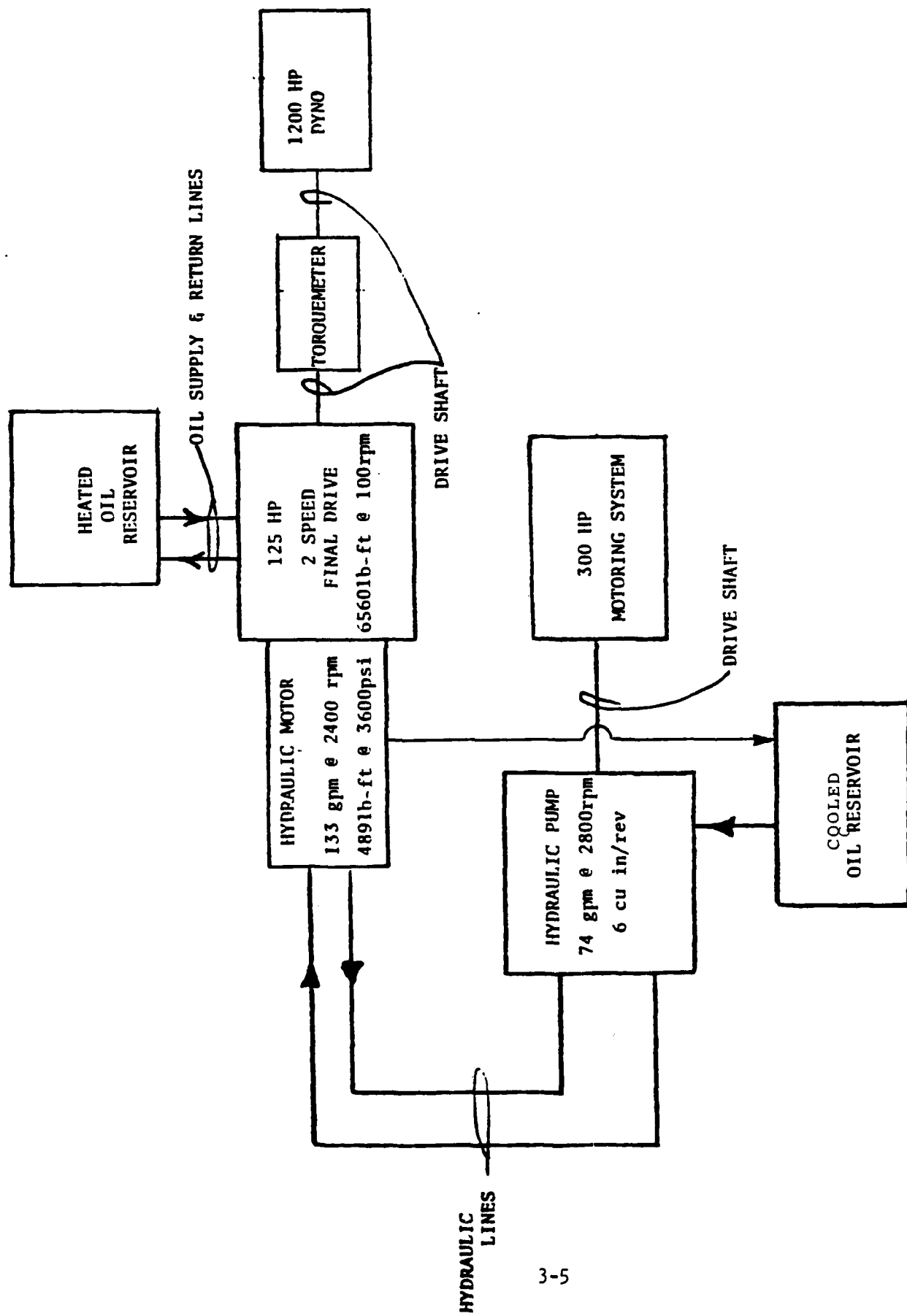


Figure 1. Schematic of the test set-up for Acceptance Testing of the 2-Speed Final Drives

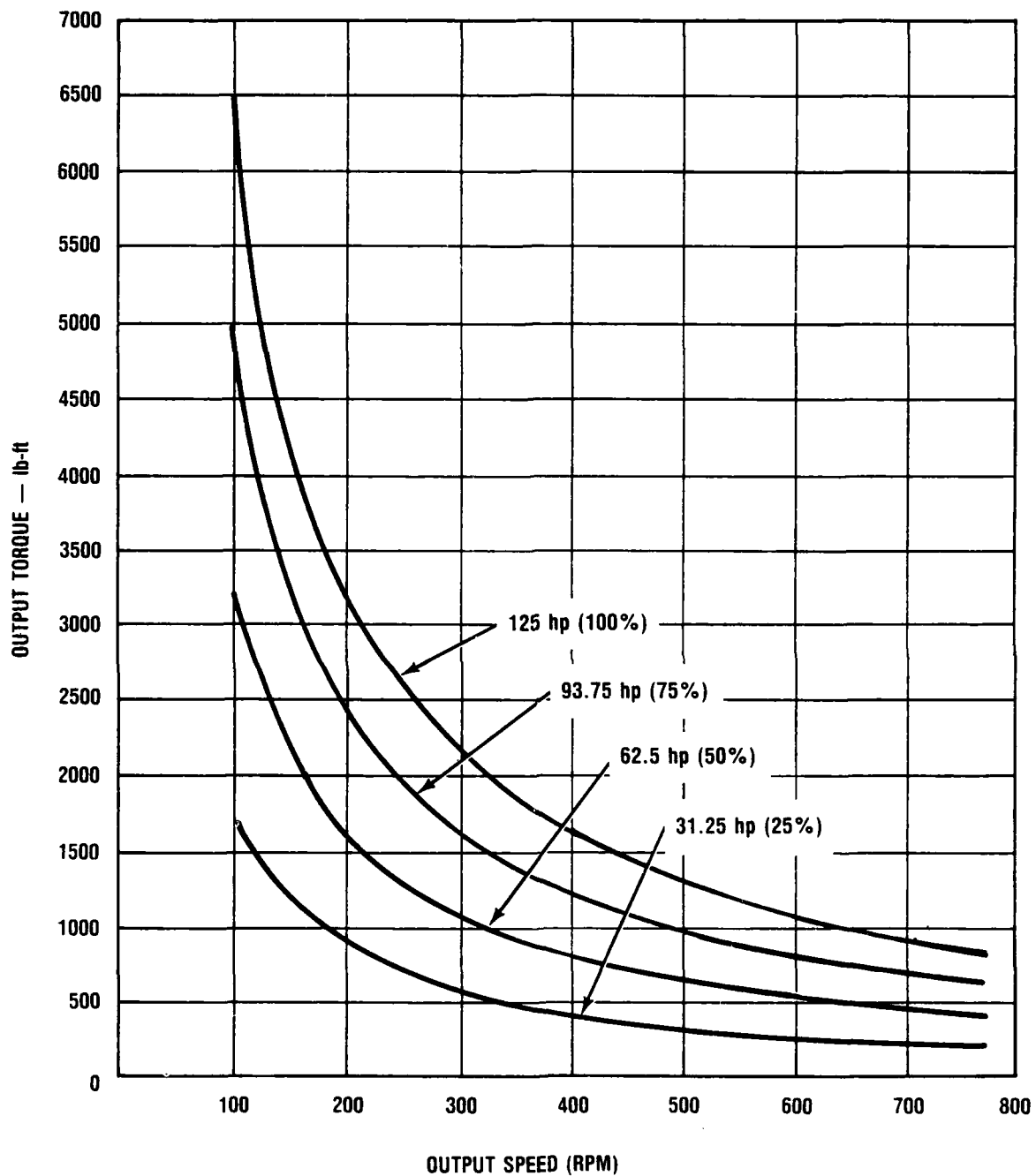


Figure 2. Final Drive Output Speed vs Output Torque for 25%, 50%, 75%, and 100% Output Power



Appendix 4

Test Data

## TEST DATA

### DISCUSSION

#### General

All four Two-Speed Final Drives were tested at FMC Dynamometer Facility, Ordnance Division (Engineering) San Jose, California, between August 24, 1984 and November 11, 1984.

#### Instrumentation

The photograph below shows the data acquisition system used to scan and record the values from fourteen sensors. Final drive inlet temperatures and sump temperatures were recorded manually and added to the data sheets after the test. Due to instrumentation problems, Brake Lube Flow and the Control Flow values were recorded manually until 10-13-84. Output Power was calculated by the computer from the scanned values for output torque and output speed. Final drive output power was set by the operator using the dynamometer torque control and the final drive output speed.

The no-load condition was the minimum torque required to turn the dynamometer at the speed ranges required.

#### Shift Control System

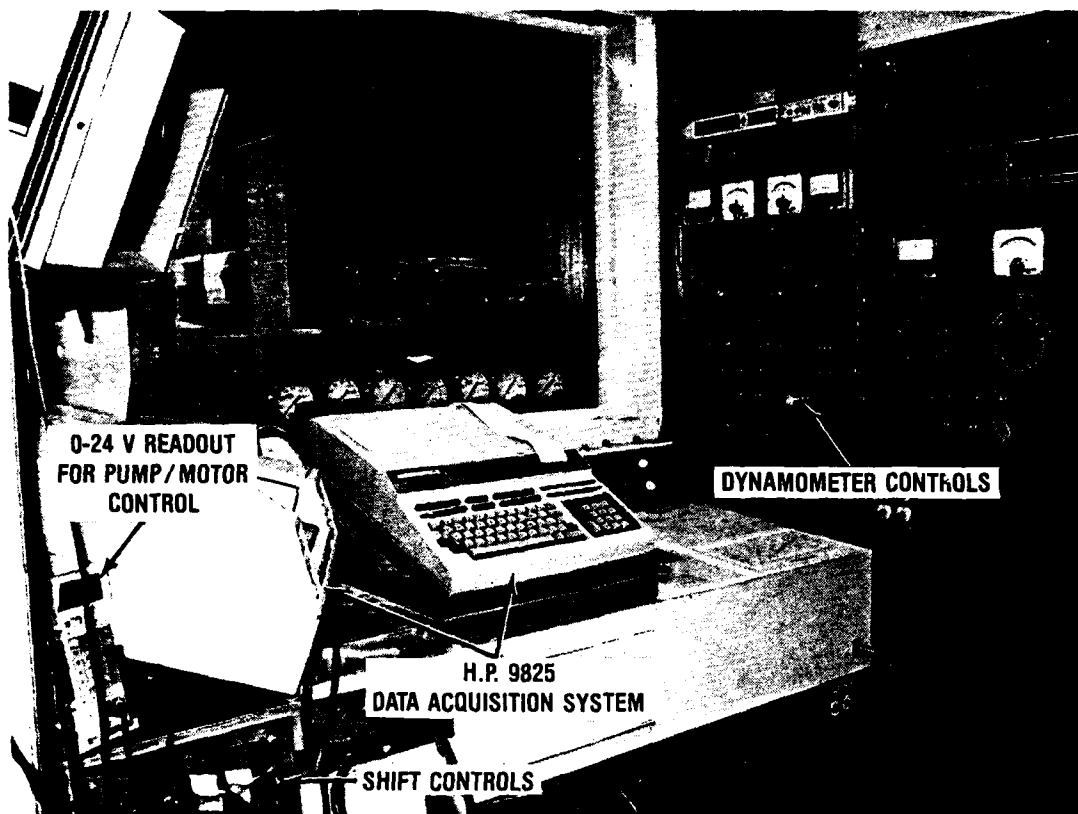
The hydraulic control system for brake disengagement, brake lubrication, and clutch actuation used three position solenoid valves on each clutch. When position A was selected on either clutch, the high pressure oil was allowed to flow into the clutch cavity and engage the clutch. When the B position was selected, oil was allowed to drain from the clutch, and low oil pressure was maintained in the clutch cavity by the check valve. Solenoid positions were selected by toggle switches at the operator's station.

The final drive input speed was controlled by a 24-volt DC power supply controlling the servo valve on the hydraulic pump.

Preliminary testing showed that the operator could not disengage one clutch and adjust the final drive input speed before the output shaft speed slowed down out of the required range. During testing of the third and fourth final drive, a double power supply system was developed. The input shaft speed was controlled by one power supply until the first clutch was disengaged. At this point the input speed was changed in one jump to the required speed by switching to the second power supply with the appropriate voltage. Then the second clutch was engaged.

**FMC**

**FMC**



**Two-Speed Final Drive Test Control System and Data Acquisition System**

FINAL DRIVE

S/N 1

Table 7. S/N 001

This sheet is a summarization of the functional test conducted in accordance with this test plan.

PERCENT OF RATED POWER	DIRECTION	ACCUMULATED HOURS	ACTUAL POWER OUTPUT (H.P.)
0	FORWARD	2 hrs 31 min	0 - *
	REVERSE	2 hrs 30 min	"
25 $\pm$ 2%	FORWARD	3 hrs 33 min	28 - 35
	REVERSE	3 hrs 30 min	"
50 $\pm$ 2%	FORWARD	2 hrs 34 min	59 - 68
	REVERSE	2 hrs 30 min	"
75 $\pm$ 2%	FORWARD	60 min	91 - 97
	REVERSE	68 min	"
100 $\pm$ 2%	FORWARD	30 min	121 - 128
	REVERSE	30 min	"
TOTAL HOURS	FORWARD	10 hrs 8 min	—
	REVERSE	10 hrs 8 min	—

Accumulated hours are calculated from start/stop times recorded by the computer. Actual power outputs are calculated from the output speed and torque values recorded by the computer.

Total Shifts = 100

\* Actual H.P. depended on the minimum torque to turn the  
dyno at that output speed.

PTP10130REVA

Test Engineer: Nadine Barr

Date: 12:01:84

Final Drive S/N 1

Run No. 1

	09:20:49	09:25:00	09:30:03	09:35:00	09:40:05
FD Output Power (hp)	0	4	3	4	3
Output Torque(lb-ft)	-24	201	183	188	179
FD Output Speed(rpm)	0	107	107	99	98
FD Input Speed (rpm)	0	1118	1050	1037	1029
Pump Speed (rpm)	2214	2214	2215	2217	2222
Pump P Pressure(psi)	502	477	473	472	471
Pump S Pressure(psi)	2998	3523	3420	3391	3354
Pump Control Volt(V)	-0.0	7.1	7.1	7.1	7.1
Ambient (oF)	68	66	66	66	66
Temp into F.D. (oF)		101			
Temp inside F.D.(oF)		96			
Brake Lube Flow (gpm)	.55				

	09:45:05	09:50:04	09:55:04	10:00:03	10:05:03
FD Output Power (hp)	3	6	10	10	0
Output Torque(lb-ft)	170	219	262	265	-27
FD Output Speed(rpm)	98	147	202	99	0
FD Input Speed (rpm)	1022	1545	2111	2092	0
Pump Speed (rpm)	2222	2220	2219	2221	2230
Pump P Pressure(psi)	470	472	466	465	494
Pump S Pressure(psi)	3345	3817	3752	3677	2876
Pump Control Volt(V)	7.1	8.9	10.6	10.6	-0.0
Ambient (oF)	67	68	73	78	79
Temp into F.D. (oF)	129	145			
Temp inside F.D.(oF)	136	167			
Brake Lube Flow (gpm)					.56

	10:10:00	10:15:02	10:20:03	10:25:01	10:30:02
FD Output Power (hp)	9	9	20	19	20
Output Torque(lb-ft)	331	335	321	317	322
FD Output Speed(rpm)	324	322	321	321	321
FD Input Speed (rpm)	1445	1444	1441	1437	1435
Pump Speed (rpm)	2221	2224	2223	2221	2222
Pump P Pressure(psi)	459	463	467	460	464
Pump S Pressure(psi)	4491	4437	4382	4355	4356
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Ambient (oF)	74	75	72	72	72
Temp into F.D. (oF)	168				
Temp inside F.D.(oF)	187				

	10:35:00	10:40:02	10:45:02	10:50:03	10:55:03
FD Output Power (hp)	20	26	26	25	25
Output Torque(lb-ft)	324	349	350	327	335
FD Output Speed(rpm)	320	398	397	395	394
FD Input Speed (rpm)	1431	1780	1776	1769	1768
Pump Speed (rpm)	2221	2221	2225	2223	2222
Pump P Pressure(psi)	464	459	458	456	461
Pump S Pressure(psi)	4344	4780	4712	4673	2237
Pump Control Volt(V)	8.4	9.9	9.9	9.9	9.9
Ambient (oF)	72	72	76	77	74
Temp into F.D. (oF)		180			174
Temp inside F.D.(oF)		197			194

Date: 10:01:84

	11:00:00	11:05:02	11:10:00	11:15:00	11:20:04
FD Output Power (hp)	31	31	33	30	39
Output Torque(lb-ft)	357	360	376	346	362
FD Output Speed(rpm)	459	458	457	455	538
FD Input Speed (rpm)	2059	2041	2053	2039	2411
Pump Speed (rpm)	2221	2222	2221	2218	2214
Pump P Pressure(psi)	452	455	462	458	457
Pump S Pressure(psi)	2812	2710	2644	2713	3479
Pump Control Volt(V)	11.2	11.2	11.2	11.2	12.2
Ambient (oF)	74	73	73	73	73
Temp into F.D. (oF)					171
Temp inside F.D.(oF)					199
Brake Lube Flow (gpm)				.65	

	11:25:06	11:30:01	11:35:08	<del>14:53:07</del>	<del>14:58:00</del>
FD Output Power (hp)	41	41	0	<del>25</del>	<del>20</del>
Output Torque(lb-ft)	403	408	-29	<del>1003</del>	<del>448</del>
FD Output Speed(rpm)	532	529	0	<del>301</del>	<del>560</del>
FD Input Speed (rpm)	2386	2370	0	<del>1373</del>	<del>2494</del>
Pump Speed (rpm)	2217	2219	0	<del>2215</del>	<del>2198</del>
Pump P Pressure(psi)	456	456	-0	<del>422</del>	<del>381</del>
Pump S Pressure(psi)	3394	3358	-0	<del>1783</del>	<del>4089</del>
Pump Control Volt(V)	12.2	12.2	0.0	<del>9.1</del>	<del>13.7</del>
Ambient (oF)	73	73	73	<del>85</del>	<del>85</del>
Temp into F.D. (oF)	165				
Temp inside F.D.(oF)	195				
Brake Lube Flow (gpm)	.58				



Test Engineer: Nadine Barr  
 Date: 12:01:84  
 Final Drive S/N 1  
 Run No. 2

	12:41:16	12:47:49	12:50:05	12:55:04	13:00:02
FD Output Power (hp)	0	17	17	17	17
Output Torque(lb-ft)	-27	298	307	296	302
FD Output Speed(rpm)	0	292	293	295	296
FD Input Speed (rpm)	0	1308	1311	1324	1325
Pump Speed (rpm)	0	2246	2245	2249	2250
Pump P Pressure(psi)	-0	478	476	470	469
Pump S Pressure(psi)	0	1592	1623	1584	1563
Pump Control Volt(V)	0.0	7.8	7.8	7.3	7.5
Ambient (oF)	70	71	71	71	72
Temp into F.D. (oF)			168		
Temp inside F.D.(oF)			169		
Brake Lube Flow(gpm)			.59		

	13:05:01	13:05:37	13:16:05	13:16:42	13:21:42
FD Output Power (hp)	71	42	-7	-7	-7
Output Torque(lb-ft)	572	342	-241	-239	-250
FD Output Speed(rpm)	648	641	143	143	144
FD Input Speed (rpm)	2903	2873	1437	1496	1503
Pump Speed (rpm)	2244	2267	2258	2262	2262
Pump P Pressure(psi)	449	463	1170	1136	1152
Pump S Pressure(psi)	4998	4187	392	392	390
Pump Control Volt(V)	13.5	13.5	8.0	8.0	8.0
Ambient (oF)	72	72	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Brake Lube Flow (gpm)				.60	

	13:26:41	13:31:41	13:36:44	13:41:41	13:46:42
FD Output Power (hp)	-7	-7	-7	-4	-11
Output Torque(lb-ft)	-244	-257	-259	-219	-326
FD Output Speed(rpm)	144	144	144	*	*
FD Input Speed (rpm)	1506	1508	1511	2123	2379
Pump Speed (rpm)	2261	2262	2263	2259	2263
Pump P Pressure(psi)	1144	1144	1137	1524	1659
Pump S Pressure(psi)	389	388	386	391	388
Pump Control Volt(V)	3.0	8.0	8.0	10.1	10.8
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:51:42	13:56:43	14:00:00	14:05:01	14:10:01
FD Output Power (hp)	-13	-12	-12	0	0
Output Torque(lb-ft)	-312	-327	-319	-28	-28
FD Output Speed(rpm)	214	*	*	0	0
FD Input Speed (rpm)	2374	2372	2371	0	0
Pump Speed (rpm)	2267	2267	2268	2275	2273
Pump P Pressure(psi)	1603	1577	1579	494	497
Pump S Pressure(psi)	386	385	380	411	415
Pump Control Volt(V)	10.8	10.8	10.8	-0.0	-0.0
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)			168		
Temp inside F.D.(oF)			169		

\* Output Speed not correct

Date: 10:01:84

	14:15:01	14:20:03	14:25:02	14:30:01	14:35:05
FD Output Power (hp)	0	-21	-22	-22	-21
Output Torque(lb-ft)	-28	-347	-365	-365	-359
FD Output Speed(rpm)	0	315	313	311	310
FD Input Speed (rpm)	0	1414	1405	1394	1390
Pump Speed (rpm)	2273	2265	2265	2266	2268
Pump P Pressure(psi)	497	2285	2204	2127	2099
Pump S Pressure(psi)	415	389	388	390	387
Pump Control Volt(V)	-0.0	7.6	7.6	7.6	7.6
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					181
Temp inside F.D.(oF)					207
Brake Lube Flow (gpm)			.54		

	14:40:04	14:45:03	14:50:03	14:55:02	15:00:05
FD Output Power (hp)	-20	-20	-21	-20	-32
Output Torque(lb-ft)	-346	-348	-353	-340	-408
FD Output Speed(rpm)	309	309	310	309	408
FD Input Speed (rpm)	1385	1386	1386	1386	1926
Pump Speed (rpm)	2266	2267	2272	2274	2272
Pump P Pressure(psi)	2107	2069	2065	2075	2781
Pump S Pressure(psi)	388	385	386	388	392
Pump Control Volt(V)	7.6	7.6	7.6	7.6	9.6
Ambient (oF)	74	74	74	74	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:05:01	15:10:03	15:15:03	15:20:02	15:25:00
FD Output Power (hp)	-31	-40	-37	-38	-37
Output Torque(lb-ft)	-403	-454	-426	-432	-423
FD Output Speed(rpm)	406	468	461	457	458
FD Input Speed (rpm)	1820	2099	2059	2045	2060
Pump Speed (rpm)	2276	2272	2275	2276	2275
Pump P Pressure(psi)	2746	3365	3167	3199	3113
Pump S Pressure(psi)	383	378	391	321	377
Pump Control Volt(V)	9.6	10.5	10.4	10.4	10.4
Ambient (oF)	74	74	74	74	75
Temp into F.D. (oF)	168				
Temp inside F.D.(oF)	200				

	15:30:04	15:35:02	15:40:03	15:45:02	15:50:00
FD Output Power (hp)	-38	-37	-38	-9	0
Output Torque(lb-ft)	-436	-423	-429	-127	-66
FD Output Speed(rpm)	462	463	464	352	0
FD Input Speed (rpm)	2075	2075	2077	1568	0
Pump Speed (rpm)	2280	2279	2277	2292	0
Pump P Pressure(psi)	3111	3192	3083	856	-0
Pump S Pressure(psi)	381	380	379	390	0
Pump Control Volt(V)	10.4	10.4	10.4	7.5	0.0
Ambient (oF)	74	75	75	75	75
Temp into F.D. (oF)			182		
Temp inside F.D.(oF)			211		

Test Engineer: Nadine Barr  
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 Run No. 3

	00:16:45	00:21:40	00:26:43	00:31:41	00:36:41
FD Output Power (hp)	-25	-22	-21	-20	-20
Output Torque(lb-ft)	-336	-313	-301	-296	-302
FD Output Speed(rpm)	385	368	359	357	355
FD Input Speed (rpm)	1726	1645	1607	1590	1591
Pump Speed (rpm)	2146	2152	2151	2153	2158
Pump P Pressure(psi)	3068	2697	2516	2425	2373
Pump S Pressure(psi)	397	391	389	366	385
Pump Control Volt(V)	8.8	8.8	8.8	8.0	8.3
Ambient (oF)	72	72	73	74	75
Temp into F.D. (oF)				175	
Temp inside F.D.(oF)				202	
Brake Lube Flow (gpm)	.63				

	00:38:57	00:40:05	00:16:45	<del>10:50:03</del>	<del>10:55:05</del>
FD Output Power (hp)	-20	-20	0	0	3068
Output Torque(lb-ft)	-296	-294	0	0	2697
FD Output Speed(rpm)	356	355	284	0	2425
FD Input Speed (rpm)	1595	1592	0	0	2373
Pump Speed (rpm)	2192	2158	0	0	2345
Pump P Pressure(psi)	2345	2355	2642	2552	2545
Pump S Pressure(psi)	384	380	365	366	366
Pump Control Volt(V)	8.8	8.8	7.8	7.8	7.8
Ambient (oF)	75	75	73	73	73
Temp into F.D. (oF)		173			
Temp inside F.D.(oF)		201			

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	14:05:04	14:10:02	14:15:04	14:20:04	14:25:01
FD Output Power (hp)	-32	-31	-31	-31	-32
Output Torque(lb-ft)	-471	-466	-460	-462	-473
FD Output Speed(rpm)	353	354	354	354	355
FD Input Speed (rpm)	1581	1582	1589	1584	1587
Pump Speed (rpm)	2226	2228	2228	2229	2229
Pump P Pressure(psi)	2733	2760	2719	2719	2702
Pump S Pressure(psi)	387	384	389	387	385
Pump Control Volt(V)	8.9	8.9	8.9	8.9	8.9
Ambient (oF)	75	74	74	74	74
Temp into F.D. (oF)		170			
Temp inside F.D.(oF)		201			

	14:30:00	14:35:03	14:40:00	14:45:04	14:50:02
FD Output Power (hp)	-33	-33	-34	-34	-34
Output Torque(lb-ft)	-454	-457	-467	-440	-440
FD Output Speed(rpm)	383	384	382	409	410
FD Input Speed (rpm)	1715	1716	1715	1834	1835
Pump Speed (rpm)	2228	2226	2232	2223	2234
Pump P Pressure(psi)	2914	2851	2898	3040	3052
Pump S Pressure(psi)	384	388	384	383	385
Pump Control Volt(V)	9.5	9.5	9.5	9.8	9.8
Ambient (oF)	74	74	74	74	74
Temp into F.D. (oF)			168		174
Temp inside F.D.(oF)			196		202
Brake Lube Flow (gpm)				.62	

	14:55:01	15:00:00	15:05:01	15:10:02	15:15:04
FD Output Power (hp)	-35	-35	-34	-34	-34
Output Torque(lb-ft)	-449	-449	-438	-445	-442
FD Output Speed(rpm)	411	409	407	404	403
FD Input Speed (rpm)	1841	1832	1820	1810	1810
Pump Speed (rpm)	2232	2234	2234	2235	2237
Pump P Pressure(psi)	2955	2961	2982	2966	2950
Pump S Pressure(psi)	387	385	379	378	385
Pump Control Volt(V)	9.8	9.8	9.8	9.8	9.8
Ambient (oF)	74	74	74	74	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:20:03	15:25:00	15:30:02	15:35:00	15:40:03
FD Output Power (hp)	-33	-34	-34	-33	-33
Output Torque(lb-ft)	-432	-442	-447	-435	-434
FD Output Speed(rpm)	403	404	404	404	404
FD Input Speed (rpm)	1805	1808	1812	1809	1809
Pump Speed (rpm)	2238	2239	2241	2240	2242
Pump P Pressure(psi)	2934	2910	2918	2924	2898
Pump S Pressure(psi)	381	377	379	384	380
Pump Control Volt(V)	9.8	9.8	9.8	9.8	9.8
Ambient (oF)	74	74	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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Final Drive S/N 1

Run No. 4

	12:31:31	12:33:23	12:38:24	12:43:21	12:48:25
FD Output Power (hp)	0	-4	-31	-30	-30
Output Torque(lb-ft)	-2	-189	-1631	-1612	-1645
FD Output Speed(rpm)	0	105	100	98	97
FD Input Speed (rpm)	0	1103	1046	1025	1015
Pump Speed (rpm)	2223	2223	2216	2214	2219
Pump P Pressure(psi)	512	1127	2328	2252	2253
Pump S Pressure(psi)	432	404	396	394	392
Pump Control Volt(V)	-0.0	6.6	6.6	6.6	6.6
Ambient (oF)	74	74	74	75	75
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Brake Lube Flow (gpm)					.57

	12:53:25	12:53:24	13:00:00	13:05:04	13:10:03
FD Output Power (hp)	-32	-34	-34	-33	-34
Output Torque(lb-ft)	-1520	-1171	-1177	-1152	-1208
FD Output Speed(rpm)	110	151	151	149	149
FD Input Speed (rpm)	1149	1577	1579	1566	1559
Pump Speed (rpm)	2217	2216	2218	2221	2223
Pump P Pressure(psi)	2214	2237	2190	2160	2196
Pump S Pressure(psi)	390	387	387	391	391
Pump Control Volt(V)	7.0	8.6	8.6	8.6	8.6
Ambient (oF)	75	75	75	76	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:15:03	13:20:02	13:25:03	13:30:03	13:35:04
FD Output Power (hp)	-33	30	30	30	30
Output Torque(lb-ft)	-1178	-718	-740	-737	-737
FD Output Speed(rpm)	148	*217	*215	*215	*215
FD Input Speed (rpm)	1553	2270	2257	2252	2250
Pump Speed (rpm)	2220	2222	2228	2228	2227
Pump P Pressure(psi)	2154	2275	2234	2224	2270
Pump S Pressure(psi)	385	389	385	385	387
Pump Control Volt(V)	8.6	10.8	10.8	10.8	10.8
Ambient (oF)	76	76	76	76	76
Temp into F.D. (oF)			164		
Temp inside F.D.(oF)			208		

	13:40:00	13:45:03	13:50:00	13:55:02	14:00:05
FD Output Power (hp)	-31	-30	-31	-32	-31
Output Torque(lb-ft)	-526	-522	-540	-544	-538
FD Output Speed(rpm)	306	306	306	306	307
FD Input Speed (rpm)	1370	1369	1369	1372	1374
Pump Speed (rpm)	2221	2222	2227	2225	2228
Pump P Pressure(psi)	2581	2568	2605	2617	2583
Pump S Pressure(psi)	386	384	385	384	384
Pump Control Volt(V)	7.8	7.8	7.8	7.8	7.8
Ambient (oF)	76	76	76	76	76
Temp into F.D. (oF)					166
Temp inside F.D.(oF)					188

\* Output Speed Calculated

Test Engineer: Nadine Barr

Date: 10:02:04

Final Drive S/N 1

Run No. 4

	15:40:34	<del>15:43:23</del>	15:40:43	15:45:01	15:50:00
FD Output Power (hp)	-33	<del>-15</del>	-34	-35	-34
Output Torque(lb-ft)	-442	<del>-189</del>	-439	-401	-391
FD Output Speed(rpm)	403	<del>404</del>	404	484	463
FD Input Speed (rpm)	1809	<del>1810</del>	1808	2073	2074
Pump Speed (rpm)	2242	<del>2241</del>	2242	2238	2239
Pump P Pressure(psi)	2939	<del>2928</del>	2854	3277	3247
Pump S Pressure(psi)	377	<del>381</del>	385	378	378
Pump Control Volt(V)	9.8	<del>9.8</del>	9.8	10.8	10.8
Ambient (oF)	73	<del>73</del>	73	73	73
Temp into F.D. (oF)				164	
Temp inside F.D.(oF)				195	

	15:55:01	16:00:03	16:05:00	16:10:03	16:15:05
FD Output Power (hp)	-35	-35	-35	-60	-58
Output Torque(lb-ft)	-394	-393	-395	-706	-797
FD Output Speed(rpm)	463	463	464	444	381
FD Input Speed (rpm)	2079	2074	2077	1982	1706
Pump Speed (rpm)	2239	2243	2242	2236	2237
Pump P Pressure(psi)	3325	3298	3250	4194	3800
Pump S Pressure(psi)	378	380	379	368	377
Pump Control Volt(V)	10.8	10.8	10.8	10.8	9.6
Ambient (oF)	72	73	73	73	73
Temp into F.D. (oF)				-172	
Temp inside F.D.(oF)				205	

	16:20:00	16:25:00	16:30:03	16:35:00	16:40:04
FD Output Power (hp)	-67	-67	-62	-62	-61
Output Torque(lb-ft)	-932	-940	-864	-814	-816
FD Output Speed(rpm)	376	376	375	397	395
FD Input Speed (rpm)	1632	1682	1683	1778	1770
Pump Speed (rpm)	2235	2236	2242	2238	2239
Pump P Pressure(psi)	4215	4162	3941	4064	4050
Pump S Pressure(psi)	374	375	377	371	374
Pump Control Volt(V)	9.6	9.6	9.6	10.1	10.1
Ambient (oF)	72	73	73	72	72
Temp into F.D. (oF)		166			
Temp inside F.D.(oF)		195			

	16:45:02	16:50:03	16:55:03	17:00:00	17:05:04
FD Output Power (hp)	-62	-62	-62	-59	-63
Output Torque(lb-ft)	-828	-825	-824	-659	-712
FD Output Speed(rpm)	394	394	394	472	463
FD Input Speed (rpm)	1762	1768	1768	2124	2072
Pump Speed (rpm)	2238	2241	2245	2244	2240
Pump P Pressure(psi)	4075	4041	4028	4282	4421
Pump S Pressure(psi)	370	366	376	373	364
Pump Control Volt(V)	10.1	10.1	10.1	11.3	11.3
Ambient (oF)	72	73	73	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Date: 10:02:54

	17:10:00	17:15:02	17:20:04	17:25:01	17:25:23
FD Output Power (hp)	-61	-65	-65	-66	-57
Output Torque(lb-ft)	-638	-872	-873	-884	-890
FD Output Speed(rpm)	461	389	391	392	393
FD Input Speed (rpm)	2074	1742	1754	1758	1758
Pump Speed (rpm)	2241	2244	2242	2244	2244
Pump P Pressure(psi)	4367	4115	4180	4228	4193
Pump S Pressure(psi)	362	368	369	370	372
Pump Control Volt(V)	11.3	10.1	10.1	10.1	10.1
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	17:27:30	17:30:01	17:41:10	17:39:14	17:38:26
FD Output Power (hp)	-64	-61	0	0	0
Output Torque(lb-ft)	-615	-589	0	0	0
FD Output Speed(rpm)	547	543	0	0	0
FD Input Speed (rpm)	2454	2435	0	0	0
Pump Speed (rpm)	2238	2242	0	0	0
Pump P Pressure(psi)	4991	4858	-0	-0	-0
Pump S Pressure(psi)	365	368	0	0	0
Pump Control Volt(V)	12.2	12.2	0.0	0.0	0.0
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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 Date: 10:03:84  
 Final Drive S/N 1  
 Run No. 5

	06:24:27	06:25:04	06:27:26	06:30:06	06:35:00
FD Output Power (hp)	0	6	6	27	31
Output Torque(lb-ft)	29	281	287	1361	1601
FD Output Speed(rpm)	0	111	109	104	101
FD Input Speed (rpm)	0	1162	1142	1099	1059
Pump Speed (rpm)	2048	2040	2044	2042	2045
Pump P Pressure(psi)	501	466	464	462	464
Pump S Pressure(psi)	2884	3705	3489	1853	1866
Pump Control Volt(V)	-0.0	7.5	7.5	7.5	7.5
Ambient (oF)	69	70	70	70	70
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Brake Lube Flow (gpm)					.55

	06:40:03	06:45:05	06:50:00	06:55:02	07:00:07
FD Output Power (hp)	31	31	31	31	31
Output Torque(lb-ft)	1642	1611	1627	1636	1606
FD Output Speed(rpm)	100	100	100	100	101
FD Input Speed (rpm)	1045	1046	1050	1051	1054
Pump Speed (rpm)	2043	2040	2041	2044	2041
Pump P Pressure(psi)	459	458	452	455	454
Pump S Pressure(psi)	1866	1821	1844	1818	1802
Pump Control Volt(V)	7.5	7.5	7.5	7.5	7.5
Ambient (oF)	71	71	71	71	72
Temp into F.D. (oF)		158		172	
Temp inside F.D.(oF)		160		173	

	07:05:00	07:10:01	07:15:04	07:20:03	07:25:02
FD Output Power (hp)	30	30	30	29	29
Output Torque(lb-ft)	915	917	901	883	877
FD Output Speed(rpm)	*174	*173	*173	*172	*172
FD Input Speed (rpm)	1831	1817	1817	1810	1810
Pump Speed (rpm)	2038	2039	2041	2039	2043
Pump P Pressure(psi)	459	455	456	455	452
Pump S Pressure(psi)	1791	1774	1719	1736	1708
Pump Control Volt(V)	10.7	10.7	10.7	10.7	10.7
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	07:30:04	07:35:04	07:40:03	07:45:05	07:50:02
FD Output Power (hp)	28	28	28	25	28
Output Torque(lb-ft)	858	850	846	839	840
FD Output Speed(rpm)	*172	*172	*178	159	*175
FD Input Speed (rpm)	1808	1809	1837	1841	1834
Pump Speed (rpm)	2043	2044	2041	2042	2041
Pump P Pressure(psi)	457	452	442	445	446
Pump S Pressure(psi)	1702	1678	1681	1693	1662
Pump Control Volt(V)	10.7	10.7	10.7	10.7	10.7
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated



Date: 10:03:84

	07:55:02	08:01:52	08:05:02	08:10:00	08:15:00
FD Output Power (hp)	0	24	32	31	30
Output Torque(lb-ft)	-2752	388	513	504	495
FD Output Speed(rpm)	0	329	323	312	321
FD Input Speed (rpm)	0	1477	1450	1439	1436
Pump Speed (rpm)	2401	2133	2131	2134	2133
Pump P Pressure(psi)	448	460	453	452	447
Pump S Pressure(psi)	2645	1929	2167	2117	2049
Pump Control Volt(V)	3.8	8.2	8.2	8.2	8.2
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	08:20:04	09:20:01	09:25:01	09:30:02	09:35:03
FD Output Power (hp)	0	35	33	31	34
Output Torque(lb-ft)	-29	625	600	576	624
FD Output Speed(rpm)	0	293	287	284	282
FD Input Speed (rpm)	0	1311	1286	1271	1265
Pump Speed (rpm)	0	2132	2136	2136	2133
Pump P Pressure(psi)	-9	469	463	454	454
Pump S Pressure(psi)	13	2187	2009	1333	2008
Pump Control Volt(V)	-0.0	7.3	7.3	7.3	7.3
Ambient (oF)	72	63	64	63	63
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Brake Lube Flow (gpm)		.54			

	09:40:05	09:45:02	09:50:00	09:55:00	10:00:00
FD Output Power (hp)	32	32	32	32	32
Output Torque(lb-ft)	619	609	619	615	614
FD Output Speed(rpm)	275	274	272	277	276
FD Input Speed (rpm)	1260	1254	1248	1241	1236
Pump Speed (rpm)	2135	2138	2134	2141	2139
Pump P Pressure(psi)	457	455	454	454	456
Pump S Pressure(psi)	1966	1932	1939	1917	1997
Pump Control Volt(V)	7.3	7.3	7.3	7.3	7.3
Ambient (oF)	63	64	66	76	79
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:05:02	10:10:03	10:15:05	10:20:00	10:25:00
FD Output Power (hp)	31	31	31	32	30
Output Torque(lb-ft)	603	607	589	595	584
FD Output Speed(rpm)	269	270	272	280	271
FD Input Speed (rpm)	1234	1236	1245	1252	1248
Pump Speed (rpm)	2143	2144	2144	2142	2143
Pump P Pressure(psi)	454	453	450	454	456
Pump S Pressure(psi)	1882	1857	1892	1865	1868
Pump Control Volt(V)	7.3	7.3	7.3	7.3	7.3
Ambient (oF)	78	75	74	74	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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Run No. 5

	10:25:38	10:30:03	10:35:01	10:40:05	10:45:04
FD Output Power (hp)	30	36	32	30	30
Output Torque(lb-ft)	584	710	599	439	434
FD Output Speed(rpm)	271	268	278	357	359
FD Input Speed (rpm)	1246	1233	1245	1600	1609
Pump Speed (rpm)	2142	2140	2145	2144	2144
Pump P Pressure(psi)	458	450	451	455	454
Pump S Pressure(psi)	1869	2117	1895	2011	1957
Pump Control Volt(V)	7.3	7.3	7.3	9.2	9.2
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:50:03	10:55:00	11:00:00	11:05:01	11:10:01
FD Output Power (hp)	30	30	29	29	29
Output Torque(lb-ft)	438	438	428	427	430
FD Output Speed(rpm)	360	360	359	358	358
FD Input Speed (rpm)	1618	1610	1606	1607	1603
Pump Speed (rpm)	2143	2143	2146	2142	2149
Pump P Pressure(psi)	449	459	454	453	459
Pump S Pressure(psi)	1970	1940	1967	1963	1923
Pump Control Volt(V)	9.2	9.2	9.2	9.2	9.2
Ambient (oF)	73	73	73	74	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:15:02	11:20:05	11:25:01	11:30:00	11:35:05
FD Output Power (hp)	29	64	64	63	64
Output Torque(lb-ft)	429	876	873	864	875
FD Output Speed(rpm)	357	385	384	383	382
FD Input Speed (rpm)	1600	1730	1718	1714	1709
Pump Speed (rpm)	2145	2136	2139	2137	2139
Pump P Pressure(psi)	464	455	450	453	453
Pump S Pressure(psi)	1896	3233	3210	3181	3158
Pump Control Volt(V)	9.2	10.1	10.1	10.1	10.1
Ambient (oF)	74	74	74	74	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:12:09	13:15:00	13:20:00	13:25:04	13:30:05
FD Output Power (hp)	62	60	68	60	61
Output Torque(lb-ft)	1087	1068	1262	1099	1085
FD Output Speed(rpm)	301	297	284	287	293
FD Input Speed (rpm)	1347	1333	1273	1285	1316
Pump Speed (rpm)	2088	2090	2058	2092	2093
Pump P Pressure(psi)	447	444	436	442	449
Pump S Pressure(psi)	3239	3118	3249	2991	3040
Pump Control Volt(V)	8.6	8.6	8.6	8.6	8.6
Ambient (oF)	71	71	72	72	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Date: 10:03:24

	13:35:01	13:40:03	13:45:05	13:50:04	13:55:03
FD Output Power (hp)	61	61	61	62	61
Output Torque(lb-ft)	1082	1072	1062	1077	1059
FD Output Speed(rpm)	297	300	302	303	304
FD Input Speed (rpm)	1333	1344	1351	1355	1361
Pump Speed (rpm)	2092	2094	2096	2098	2101
Pump P Pressure(psi)	453	453	453	450	450
Pump S Pressure(psi)	3067	3052	3045	3107	3077
Pump Control Volt(V)	8.6	8.6	8.6	8.6	9.6
Ambient (oF)	72	73	73	73	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:00:02	14:05:01	14:32:31	14:35:05	14:40:04
FD Output Power (hp)	59	0	65	61	60
Output Torque(lb-ft)	1022	2	962	907	908
FD Output Speed(rpm)	305	0	357	354	349
FD Input Speed (rpm)	1367	0	1601	1587	1565
Pump Speed (rpm)	2102	0	2015	2016	2019
Pump P Pressure(psi)	458	38	465	459	453
Pump S Pressure(psi)	2995	42	3362	3212	3135
Pump Control Volt(V)	9.6	-0.0	9.8	9.8	9.8
Ambient (oF)	70	69	72	70	69
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:45:05	14:50:01	14:55:03	15:00:02	15:05:00
FD Output Power (hp)	60	64	65	63	63
Output Torque(lb-ft)	904	987	996	972	974
FD Output Speed(rpm)	347	343	341	342	340
FD Input Speed (rpm)	1554	1535	1527	1530	1525
Pump Speed (rpm)	2021	2023	2024	2030	2029
Pump P Pressure(psi)	453	454	455	452	450
Pump S Pressure(psi)	3046	3243	3220	3131	3185
Pump Control Volt(V)	9.8	9.8	9.8	9.8	9.8
Ambient (oF)	70	69	69	69	68
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:10:05	15:15:02	15:20:02	15:25:01	15:30:02
FD Output Power (hp)	64	64	64	63	60
Output Torque(lb-ft)	981	989	983	979	716
FD Output Speed(rpm)	341	340	341	341	439
FD Input Speed (rpm)	1524	1523	1524	1526	1963
Pump Speed (rpm)	2028	2028	2029	2029	2031
Pump P Pressure(psi)	452	452	448	456	455
Pump S Pressure(psi)	3176	3145	3186	3168	3358
Pump Control Volt(V)	9.8	9.8	9.8	9.8	11.4
Ambient (oF)	68	68	68	68	68
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr  
 Date: 10:03:84  
 Final Drive S/N 1  
 Run No. 5

	15:31:42	15:35:03	15:40:00	15:45:02	15:50:02
FD Output Power (hp)	61	60	62	60	65
Output Torque(lb-ft)	726	722	739	721	788
FD Output Speed(rpm)	440	438	438	436	434
FD Input Speed (rpm)	1964	1970	1954	1961	1939
Pump Speed (rpm)	2031	2031	2033	2030	2032
Pump P Pressure(psi)	451	444	452	451	450
Pump S Pressure(psi)	3359	3320	3325	3324	3491
Pump Control Volt(V)	11.4	11.4	11.4	11.4	11.4
Ambient (oF)	68	68	68	68	68
Temp into F.D. (oF)		165			
Temp inside F.D.(oF)		178			

	15:55:01	16:00:00	16:05:00	16:10:00	16:15:05
FD Output Power (hp)	65	66	95	94	94
Output Torque(lb-ft)	791	799	1237	1248	1492
FD Output Speed(rpm)	432	432	401	396	330
FD Input Speed (rpm)	1943	1933	1798	1773	1479
Pump Speed (rpm)	2034	2035	2028	2029	2030
Pump P Pressure(psi)	453	451	439	443	437
Pump S Pressure(psi)	3502	3494	4594	4597	4331
Pump Control Volt(V)	11.4	11.4	11.4	11.4	9.9
Ambient (oF)	69	70	70	70	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	16:20:04	16:25:03	16:30:05	16:31:39	<del>16:35:05</del>
FD Output Power (hp)	94	93	93	94	<del>64</del>
Output Torque(lb-ft)	1496	1477	1476	1490	<del>875</del>
FD Output Speed(rpm)	331	332	332	332	<del>382</del>
FD Input Speed (rpm)	1485	1490	1485	1486	<del>1709</del>
Pump Speed (rpm)	2032	2034	2033	2033	<del>2139</del>
Pump P Pressure(psi)	442	442	442	442	<del>453</del>
Pump S Pressure(psi)	4338	4290	4331	4330	<del>3158</del>
Pump Control Volt(V)	9.9	9.9	9.9	9.9	<del>10.1</del>
Ambient (oF)	71	71	71	71	<del>71</del>
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr

Date: 10/23/84

Final Drive S/N 1

Run No. 6

	16:47:57	17:03:57	17:05:03	17:10:05	17:15:00
FD Output Power (hp)	94	93	119	122	115
Output Torque(lb-ft)	1484	1463	1993	2106	1946
FD Output Speed(rpm)	332	334	313	305	310
FD Input Speed (rpm)	1489	1493	1491	1366	1369
Pump Speed (rpm)	2033	2036	2028	2020	2030
Pump P Pressure(psi)	441	441	436	438	444
Pump S Pressure(psi)	4352	4289	5478	5543	5201
Pump Control Volt(V)	9.9	9.9	9.9	9.9	9.9
Ambient (oF)	71	70	70	70	71
Temp into F.D. (oF)			165		
Temp inside F.D. (oF)			180		

	17:20:01	17:25:02	17:30:03	17:35:02	17:40:02
FD Output Power (hp)	115	121	119	122	119
Output Torque(lb-ft)	6271	6670	6582	6816	6729
FD Output Speed(rpm)	96	95	95	94	93
FD Input Speed (rpm)	1008	997	996	985	975
Pump Speed (rpm)	2032	2033	2034	2031	2036
Pump P Pressure(psi)	440	442	441	440	444
Pump S Pressure(psi)	5105	5336	5256	5387	5332
Pump Control Volt(V)	7.5	7.5	7.5	7.5	7.5
Ambient (oF)	72	72	71	72	73
Temp into F.D. (oF)	157		156		
Temp inside F.D. (oF)	189		201		

Test Engineer: Nadine Barr

Date: 10:04:84

Final Drive S/N 1

Run No. 7

	09:34:17	09:35:00	09:40:00	09:45:00	09:50:00
FD Output Power (hp)	0	-19	-46	-60	-60
Output Torque(lb-ft)	20	-320	-865	-1217	-1258
FD Output Speed(rpm)	0	307	291	260	251
FD Input Speed (rpm)	0	1377	1259	1192	1151
Pump Speed (rpm)	2151	2140	2140	2138	2138
Pump P Pressure(psi)	514	2552	3277	3859	3712
Pump S Pressure(psi)	421	394	385	374	368
Pump Control Volt(V)	0.6	7.3	7.3	7.3	7.3
Ambient (oF)	71	71	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	09:55:03	10:00:05	10:05:01	10:10:03	10:15:05
FD Output Power (hp)	-58	-84	-59	-60	-66
Output Torque(lb-ft)	-1247	-907	-563	-589	-686
FD Output Speed(rpm)	245	488	547	532	520
FD Input Speed (rpm)	1127	2199	2453	2384	2331
Pump Speed (rpm)	2138	2136	2137	2139	2138
Pump P Pressure(psi)	3720	5035	4752	4701	4846
Pump S Pressure(psi)	364	368	353	348	345
Pump Control Volt(V)	7.3	11.3	12.0	12.0	12.0
Ambient (oF)	73	73	73	74	74
Temp into F.D. (oF)		165		177	
Temp inside F.D.(oF)		175		197	

	10:20:02	10:25:05	10:30:04	10:35:04	10:40:04
FD Output Power (hp)	-63	-58	-62	-62	-62
Output Torque(lb-ft)	-635	-662	-713	-708	-709
FD Output Speed(rpm)	524	459	455	461	459
FD Input Speed (rpm)	2344	2056	2039	2070	2062
Pump Speed (rpm)	2140	2143	2146	2145	2146
Pump P Pressure(psi)	4745	4094	4376	4307	4415
Pump S Pressure(psi)	348	357	355	352	354
Pump Control Volt(V)	12.0	11.0	11.0	11.0	11.0
Ambient (oF)	74	74	74	75	75
Temp into F.D. (oF)	168		172		
Temp inside F.D.(oF)	188		191		

	10:45:00	10:50:02	10:55:02	11:00:02	11:05:04
FD Output Power (hp)	-57	-83	-94	-90	-90
Output Torque(lb-ft)	-642	-1016	-1188	-1250	-1239
FD Output Speed(rpm)	462	428	414	380	381
FD Input Speed (rpm)	2068	1917	1854	1700	1708
Pump Speed (rpm)	2149	2138	2137	2138	2143
Pump P Pressure(psi)	4065	5130	5695	5311	5268
Pump S Pressure(psi)	350	347	344	349	344
Pump Control Volt(V)	11.0	11.0	11.0	10.4	10.4
Ambient (oF)	75	75	75	75	75
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Date:10:04:84

	11:10:02	11:15:05	11:20:05	13:07:13	13:10:04
FD Output Power (hp)	-93	-92	-24	-93	-94
Output Torque(lb-ft)	-1285	-1291	-342	-5021	-4979
FD Output Speed(rpm)	379	377	374	97	100
FD Input Speed (rpm)	1697	1632	1675	1019	1043
Pump Speed (rpm)	2139	2141	2179	2126	2129
Pump P Pressure(psi)	5416	5432	1061	5536	5432
Pump S Pressure(psi)	343	344	370	372	369
Pump Control Volt(V)	10.4	10.4	8.7	7.2	7.2
Ambient (oF)	75	75	75	71	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:15:01	13:20:02	13:25:03	13:30:01	13:35:04
FD Output Power (hp)	-91	-92	-90	-62	-96
Output Torque(lb-ft)	-4893	-5070	-5010	-844	-1704
FD Output Speed(rpm)	98	95	94	306	296
FD Input Speed (rpm)	1024	997	989	1724	1325
Pump Speed (rpm)	2132	2130	2133	2108	2130
Pump P Pressure(psi)	5253	5307	5196	8201	5410
Pump S Pressure(psi)	364	361	356	267	350
Pump Control Volt(V)	7.2	7.2	7.2	16.2	8.4
Ambient (oF)	72	72	73	73	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:40:00	13:45:02	13:50:01	13:55:05	14:00:01
FD Output Power (hp)	-91	-93	-92	-83	-121
Output Torque(lb-ft)	-1573	-1587	-1563	-1506	-2239
FD Output Speed(rpm)	303	307	308	311	285
FD Input Speed (rpm)	1358	1373	1380	1392	1276
Pump Speed (rpm)	2132	2133	2136	2139	2129
Pump P Pressure(psi)	5193	5228	5205	5099	6664
Pump S Pressure(psi)	352	347	354	350	341
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Ambient (oF)	75	76	76	76	76
Temp into F.D. (oF)				171	
Temp inside F.D.(oF)				195	

	14:05:01	14:10:00	14:15:03	14:20:02	14:25:05
FD Output Power (hp)	-121	-119	-119	-120	-123
Output Torque(lb-ft)	-2274	-2262	-2361	-2382	-2351
FD Output Speed(rpm)	280	277	265	264	275
FD Input Speed (rpm)	1252	1242	1222	1215	1216
Pump Speed (rpm)	2129	2132	2130	2129	2129
Pump P Pressure(psi)	6632	6576	6731	6735	6638
Pump S Pressure(psi)	343	344	336	344	338
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Ambient (oF)	77	77	77	77	77
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr

Date: 10/04/84

Final Drive S/N 1

Run No. 7

	14:30:05	14:35:06	14:40:05	14:41:27	<del>09:50:06</del>
FD Output Power (hp)	-121	-122	0	0	<del>-60</del>
Output Torque(lb-ft)	-2343	-2359	15	11	<del>-1258</del>
FD Output Speed(rpm)	272	272	0	0	<del>271</del>
FD Input Speed (rpm)	1224	1215	0	0	<del>1151</del>
Pump Speed (rpm)	2131	2133	0	0	<del>2138</del>
Pump P Pressure(psi)	6648	6663	5	4	<del>3792</del>
Pump S Pressure(psi)	340	338	-9	-9	<del>368</del>
Pump Control Volt(V)	8.4	8.4	-0.0	-0.0	<del>7.3</del>
Ambient (oF)	77	77	77	77	<del>72</del>
Temp into F.D. (oF)					
Temp inside F.D. (oF)					



FINAL DRIVE

S/N 2

Table 8. S/N 002

This sheet is a summarization of the functional test conducted in accordance with this test plan.

PERCENT OF RATED POWER	DIRECTION	ACCUMULATED HOURS	ACTUAL POWER OUTPUT (H.P.)
0	FORWARD	2 hrs 30 min	0 - *
	REVERSE	2 hrs 30 min	"
25 $\pm$ 2%	FORWARD	3 hrs 30 min	31 - 35
	REVERSE	3 hrs 30 min	"
50 $\pm$ 2%	FORWARD	2 hrs 38 min	59 - 68
	REVERSE	2 hrs 30 min	"
75 $\pm$ 2%	FORWARD	61 min	90 - 95
	REVERSE	68 min	"
100 $\pm$ 2%	FORWARD	31 min	120 - 126
	REVERSE	30 min	"
TOTAL HOURS	FORWARD	10 hrs 10 min	-
	REVERSE	10 hrs 8 min	-

Accumulated hours are calculated from start/stop times recorded by the computer. Actual power outputs are calculated from the output speed and torque values recorded by the computer.

Total Shifts = 121

\* Actual H.P. depended on the minimum torque to turn the dyno. at that speed.

PTP10130EVA

Test Engineer: Nadine Barr  
 Date: 09:10:84  
 Final Drive S/N 2  
 Run No. 1

	10:39:36	10:45:04	10:50:07	10:55:01	11:00:05
FD Output Power (hp)	40	40	40	40	40
Output Torque(lb-ft)	1610	1610	1620	1610	1610
FD Output Speed(rpm)	*130	*130	*130	*130	*130
FD Input Speed (rpm)	582	581	581	581	582
Pump Speed (rpm)	2181	2182	2182	2183	2184
Pump P Pressure(psi)	416	419	420	416	417
Pump S Pressure(psi)	1823	1787	1769	1769	1766
Pump Control Volt(V)	7.1	7.1	7.1	7.1	7.1
Ambient (oF)	84	84	85	85	85
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:05:05	11:10:01	11:15:06	11:20:02	11:25:07
FD Output Power (hp)	40	40	40	40	40
Output Torque(lb-ft)	1620	1620	1620	1620	1620
FD Output Speed(rpm)	*130	*130	*130	*130	*130
FD Input Speed (rpm)	581	581	581	562	582
Pump Speed (rpm)	2183	2183	2183	2183	2183
Pump P Pressure(psi)	413	417	415	417	415
Pump S Pressure(psi)	1747	1758	1754	1755	1749
Pump Control Volt(V)	7.1	7.1	7.1	7.1	7.1
Ambient (oF)	85	85	86	85	85
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:30:07	11:35:04	11:41:03	11:42:06	11:43:04
FD Output Power (hp)	40	40	0	0	0
Output Torque(lb-ft)	1610	1620	-0	-0	-0
FD Output Speed(rpm)	*130	*130	0	0	0
FD Input Speed (rpm)	582	583	0	0	0
Pump Speed (rpm)	2184	2186	2289	2287	2286
Pump P Pressure(psi)	418	415	486	485	487
Pump S Pressure(psi)	1747	1756	411	409	409
Pump Control Volt(V)	7.1	7.1	-0.0	-0.0	2.7
Ambient (oF)	85	85	76	76	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated

Test Engineer: Nadine Barr  
 Date: 09:18:84  
 Final Drive S/N 2  
 Run No. 3

	14:10:05	14:11:03	14:15:02	14:18:36	14:23:07
FD Output Power (hp)	31	30	30	30	30
Output Torque(lb-ft)	823	816	803	792	796
FD Output Speed(rpm)	195	195	194	201	201
FD Input Speed (rpm)	2042	2037	2031	2026	2058
Pump Speed (rpm)	2194	2196	2196	2196	2195
Pump P Pressure(psi)	409	408	406	409	406
Pump S Pressure(psi)	1915	1902	1889	1859	1913
Pump Control Volt(V)	12.0	12.0	11.9	11.9	12.1
Ambient (oF)	85	85	84	85	85
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:28:05	14:33:00	14:38:01	14:43:02	14:48:03
FD Output Power (hp)	30	30	30	30	30
Output Torque(lb-ft)	804	806	823	808	799
FD Output Speed(rpm)	199	196	196	196	197
FD Input Speed (rpm)	2054	2051	2054	2052	2054
Pump Speed (rpm)	2196	2198	2201	2203	2203
Pump P Pressure(psi)	403	406	406	405	411
Pump S Pressure(psi)	1904	1891	1908	1886	1890
Pump Control Volt(V)	12.1	12.1	12.1	12.1	12.1
Ambient (oF)	84	84	84	84	84
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr  
 Date: 09:18:84  
 Final Drive S/N 2  
 Run No. 4

	09:18:04	09:23:04	09:28:04	09:33:04	09:38:02
FD Output Power (hp)	59	61	60	61	61
Output Torque(lb-ft)	635	645	623	647	640
FD Output Speed(rpm)	488	500	507	495	499
FD Input Speed (rpm)	2199	2215	2235	2192	2184
Pump Speed (rpm)	2187	2193	2196	2198	2198
Pump P Pressure(psi)	390	371	381	369	363
Pump S Pressure(psi)	3940	3940	3946	3900	3864
Pump Control Volt(V)	13.0	13.0	13.2	13.2	13.2
Brake Lube Flow(gpm)	0.59	0.58	0.59	0.59	0.60
Ambient (oF)	70	73	74	75	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr

Date: 09:11:84

Final Drive S/N 2

Run No. 6

	10:39:05	10:39:51	10:45:00	10:49:59	10:55:01
FD Output Power (hp)	61	59	61	61	62
Output Torque(lb-ft)	647	633	644	654	650
FD Output Speed(rpm)	495	492	496	488	501
FD Input Speed (rpm)	2208	2193	2196	2150	2230
Pump Speed (rpm)	2196	2196	2197	2198	2197
Pump P Pressure(psi)	378	382	377	367	370
Pump S Pressure(psi)	4007	4014	4050	3909	4091
Pump Control Volt(V)	12.7	12.7	12.9	12.9	13.3
Ambient (oF)	73	73	74	73	74
Temp into F.D. (oF)	164			168	166
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr  
 Date: 09:11:84  
 Final Drive S/N 2  
 Run No. 7

	12:58:58	12:59:31	13:00:05	13:05:02	13:10:04
FD Output Power (hp)	-0	-0	-0	116	58
Output Torque(lb-ft)	-16	-16	-16	2080	1050
FD Output Speed(rpm)	78	71	56	292	292
FD Input Speed (rpm)	0	0	0	1311	1285
Pump Speed (rpm)	2202	2203	2206	2218	2188
Pump P Pressure(psi)	501	500	498	430	428
Pump S Pressure(psi)	415	414	412	1599	3117
Pump Control Volt(V)	-0.0	-0.0	-0.0	8.0	8.5
Ambient (oF)	78	77	78	79	79
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:15:05	13:20:03	13:25:05	13:30:00	13:35:01
FD Output Power (hp)	62	61	61	63	61
Output Torque(lb-ft)	1093	1093	1084	1096	1083
FD Output Speed(rpm)	300	295	297	301	294
FD Input Speed (rpm)	1331	1323	1316	1317	1319
Pump Speed (rpm)	2188	2188	2186	2191	2192
Pump P Pressure(psi)	412	403	401	403	398
Pump S Pressure(psi)	3284	3240	3195	3189	3166
Pump Control Volt(V)	9.0	9.0	9.0	9.0	9.0
Ambient (oF)	79	80	80	80	79
Temp into F.D. (oF)	160				162
Temp inside F.D.(oF)					

	13:40:04	13:45:02	13:50:05	13:55:06	14:00:07
FD Output Power (hp)	60	61	59	61	60
Output Torque(lb-ft)	1065	1051	1045	1069	1065
FD Output Speed(rpm)	296	303	298	301	297
FD Input Speed (rpm)	1321	1324	1326	1325	1326
Pump Speed (rpm)	2193	2197	2198	2198	2199
Pump P Pressure(psi)	400	401	405	402	398
Pump S Pressure(psi)	3114	3093	3096	3125	3119
Pump Control Volt(V)	9.0	9.0	9.0	9.0	9.0
Ambient (oF)	79	80	79	80	80
Temp into F.D. (oF)				164	
Temp inside F.D.(oF)					

	14:05:07	14:06:26	09:43:02	09:48:01	09:52:19
FD Output Power (hp)	60	59	0	0	0
Output Torque(lb-ft)	1057	1041	18	16	16
FD Output Speed(rpm)	296	296	187	0	0
FD Input Speed (rpm)	1326	1327	0	0	0
Pump Speed (rpm)	2198	2197	534	0	0
Pump P Pressure(psi)	403	403	383	5	2
Pump S Pressure(psi)	3081	3082	317	5	4
Pump Control Volt(V)	9.0	9.0	-0.0	-0.0	0.0
Ambient (oF)	80	80	76	76	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr  
 Date: 09:11:84  
 Final Drive S/N 2  
 Run No. 8

	14:15:06	14:20:07	14:25:07	14:30:08	14:35:09
FD Output Power (hp)	62	67	63	62	68
Output Torque(lb-ft)	3121	3079	3069	3048	3069
FD Output Speed(rpm)	105	114	109	107	117
FD Input Speed (rpm)	1067	1079	1070	1082	1084
Pump Speed (rpm)	2200	2200	2199	2199	2202
Pump P Pressure(psi)	412	413	405	410	411
Pump S Pressure(psi)	2827	2820	2809	2803	2815
Pump Control Volt(V)	7.6	7.6	7.6	7.6	7.6
Ambient (oF)	80	80	80	80	80
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:40:06	14:45:07	14:50:09	14:55:01	15:00:04
FD Output Power (hp)	64	61	68	66	65
Output Torque(lb-ft)	3092	3078	3093	3094	3087
FD Output Speed(rpm)	108	104	115	113	110
FD Input Speed (rpm)	1091	1092	1092	1093	1094
Pump Speed (rpm)	2203	2204	2206	2208	2209
Pump P Pressure(psi)	414	411	411	408	412
Pump S Pressure(psi)	2822	2817	2822	2823	2813
Pump Control Volt(V)	7.6	7.6	7.6	7.6	7.6
Ambient (oF)	79	79	79	79	79
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:05:01	15:10:04	15:13:40	<del>13:55:06</del>	<del>14:00:07</del>
FD Output Power (hp)	61	61	61	<del>61</del>	<del>60</del>
Output Torque(lb-ft)	3066	3052	3033	<del>3069</del>	<del>3065</del>
FD Output Speed(rpm)	*105	*105	*105	<del>301</del>	<del>297</del>
FD Input Speed (rpm)	1097	1097	1097	<del>1325</del>	<del>1326</del>
Pump Speed (rpm)	2213	2213	2213	<del>2198</del>	<del>2199</del>
Pump P Pressure(psi)	412	417	413	<del>403</del>	<del>398</del>
Pump S Pressure(psi)	2813	2794	2779	<del>3125</del>	<del>3119</del>
Pump Control Volt(V)	7.6	7.6	7.6	<del>8.0</del>	<del>8.0</del>
Ambient (oF)	79	79	79	<del>80</del>	<del>80</del>
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated

Test Engineer: Nadine Barr

Date: 09:11:84

Final Drive S/N 2

Run No. 9

	15:19:10	15:20:04	15:25:04	15:30:04	15:35:04
FD Output Power (hp)	-1	3	31	31	30
Output Torque(lb-ft)	-60	168	534	534	519
FD Output Speed(rpm)	92	88	303	303	304
FD Input Speed (rpm)	0	373	1356	1356	1357
Pump Speed (rpm)	2239	2263	2218	2219	2220
Pump P Pressure(psi)	476	1459	415	421	416
Pump S Pressure(psi)	399	365	2151	2126	2105
Pump Control Volt(V)	-0.0	4.7	8.8	8.8	8.8
Ambient (oF)	79	79	79	79	78
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:40:01	15:45:03	15:50:04	15:55:06	16:00:08
FD Output Power (hp)	30	31	31	32	33
Output Torque(lb-ft)	512	535	540	547	552
FD Output Speed(rpm)	303	306	302	308	316
FD Input Speed (rpm)	1356	1353	1353	1353	1354
Pump Speed (rpm)	2221	2219	2220	2220	2222
Pump P Pressure(psi)	415	418	413	411	411
Pump S Pressure(psi)	2088	2146	2125	2137	2141
Pump Control Volt(V)	8.8	8.8	8.8	8.8	8.8
Ambient (oF)	78	78	77	77	77
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	16:05:05	16:10:00	16:15:00	16:20:08	16:25:08
FD Output Power (hp)	32	32	32	32	31
Output Torque(lb-ft)	538	543	538	533	522
FD Output Speed(rpm)	309	305	313	315	314
FD Input Speed (rpm)	1354	1354	1354	1356	1356
Pump Speed (rpm)	2223	2223	2222	2224	2225
Pump P Pressure(psi)	414	418	416	412	418
Pump S Pressure(psi)	2123	2128	2115	2098	2087
Pump Control Volt(V)	8.8	8.8	8.8	8.8	8.8
Ambient (oF)	77	77	76	77	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					



Test Engineer: Nadine Barr

Date: 09:12:84

Final Drive S/N 2

Run No. 18

	13:51:27	13:55:06	14:00:02	14:05:05	14:10:02
FD Output Power (hp)	4	3	4	6	8
Output Torque(lb-ft)	179	176	190	219	237
FD Output Speed(rpm)	111	101	121	148	173
FD Input Speed (rpm)	1062	1035	1211	1512	1749
Pump Speed (rpm)	2167	2169	2190	2191	2191
Pump P Pressure(psi)	426	427	416	416	414
Pump S Pressure(psi)	931	898	921	1002	1148
Pump Control Volt(V)	7.1	7.1	7.7	9.7	10.8
Ambient (oF)	80	80	80	80	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:15:03	14:20:02	14:25:08	14:30:06	14:35:05
FD Output Power (hp)	11	11	10	10	11
Output Torque(lb-ft)	266	263	264	260	258
FD Output Speed(rpm)	219	217	207	209	*206
FD Input Speed (rpm)	2168	2174	2170	2170	2167
Pump Speed (rpm)	2192	2193	2194	2196	2195
Pump P Pressure(psi)	415	416	414	411	407
Pump S Pressure(psi)	1400	1385	1381	1375	1380
Pump Control Volt(V)	12.0	12.0	12.0	12.0	12.0
Ambient (oF)	81	81	82	82	82
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated

Test Engineer: Nadine Barr  
 Date: 09:12:84  
 Final Drive S/N 2  
 Run No. 11

	14:46:25	14:50:05	14:55:01	15:00:06	15:05:02
FD Output Power (hp)	-5	-5	-5	-6	-6
Output Torque(lb-ft)	-235	-220	-230	-245	-246
FD Output Speed(rpm)	112	113	113	132	137
FD Input Speed (rpm)	1156	1159	1164	*	1300
Pump Speed (rpm)	2205	2204	2207	2207	2207
Pump P Pressure(psi)	1062	1039	1067	1124	1130
Pump S Pressure(psi)	353	350	350	349	349
Pump Control Volt(V)	7.7	7.7	7.7	8.4	8.4
Ambient (oF)	82	82	82	82	82
Temp into F.D. (oF)		163			165
Temp inside F.D.(oF)		173			175

	15:10:04	15:15:03	15:20:01	15:25:00	15:30:07
FD Output Power (hp)	-7	-7	-9	-10	-11
Output Torque(lb-ft)	-259	-256	-285	-300	-297
FD Output Speed(rpm)	142	137	167	181	190
FD Input Speed (rpm)	1433	1435	1750	1900	1900
Pump Speed (rpm)	2206	2206	2205	2205	2205
Pump P Pressure(psi)	1194	1177	1366	1467	1464
Pump S Pressure(psi)	348	348	348	346	344
Pump Control Volt(V)	9.1	9.1	10.5	11.2	11.2
Ambient (oF)	82	82	82	82	82
Temp into F.D. (oF)		166			
Temp inside F.D.(oF)		194			

	15:35:00	15:40:07	15:45:03	15:50:07	15:55:03
FD Output Power (hp)	-10	-11	-10	-14	-13
Output Torque(lb-ft)	-296	-299	-297	-324	-315
FD Output Speed(rpm)	*	187	181	222	221
FD Input Speed (rpm)	1901	1896	1896	2327	2315
Pump Speed (rpm)	2206	2207	2209	2200	2211
Pump P Pressure(psi)	1456	1448	1450	1795	1752
Pump S Pressure(psi)	343	344	343	339	336
Pump Control Volt(V)	11.2	11.2	11.2	12.5	12.5
Ambient (oF)	82	82	82	82	82
Temp into F.D. (oF)			164		
Temp inside F.D.(oF)			184		

	16:00:05	16:05:02	16:10:00	<del>07:45:04</del>	<del>07:50:03</del>
FD Output Power (hp)	-13	-14	-9	<del>62</del>	<del>65</del>
Output Torque(lb-ft)	-319	-317	-272	<del>770</del>	<del>768</del>
FD Output Speed(rpm)	222	235	169	<del>464</del>	<del>444</del>
FD Input Speed (rpm)	2312	2318	1718	<del>1901</del>	<del>1904</del>
Pump Speed (rpm)	2211	2212	2215	<del>2160</del>	<del>2160</del>
Pump P Pressure(psi)	1739	1752	1295	<del>473</del>	<del>443</del>
Pump S Pressure(psi)	337	336	342	<del>3673</del>	<del>3363</del>
Pump Control Volt(V)	12.5	12.5	10.1	<del>10.6</del>	<del>10.6</del>
Ambient (oF)	82	82	81	<del>76</del>	<del>74</del>
Temp into F.D. (oF)		166			
Temp inside F.D.(oF)		194			

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Final Drive S/N 2

Run No. 12

	08:42:02	08:50:05	08:58:22	09:00:01	09:08:20
FD Output Power (hp)	-34	-29	-33	-31	-29
Output Torque(lb-ft)	-1633	-1579	-1608	-1591	-1548
FD Output Speed(rpm)	108	97	107	101	99
FD Input Speed (rpm)	1074	1018	1056	1044	998
Pump Speed (rpm)	2192	2196	2201	2204	2207
Pump P Pressure(psi)	2298	2170	2119	2090	2068
Pump S Pressure(psi)	355	342	328	327	340
Pump Control Volt(V)	7.2	7.2	7.4	7.4	7.3
Ambient (oF)	69	70	71	71	72
Temp into F.D. (oF)	165		167		
Temp inside F.D.(oF)	155		170		

	09:13:27	09:18:23	09:23:28	09:28:23	09:33:27
FD Output Power (hp)	-36	-35	-33	-33	-34
Output Torque(lb-ft)	-1647	-1600	-1517	-1495	-1486
FD Output Speed(rpm)	114	115	114	115	120
FD Input Speed (rpm)	1171	1186	1194	1201	1203
Pump Speed (rpm)	2207	2207	2205	2208	2209
Pump P Pressure(psi)	2277	2238	2186	2177	2154
Pump S Pressure(psi)	340	344	343	342	344
Pump Control Volt(V)	7.8	7.9	7.8	7.8	7.8
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)		166			
Temp inside F.D.(oF)		177			

	09:38:25	09:43:21	09:48:23	09:53:24	09:58:27
FD Output Power (hp)	-33	-33	-34	-32	-32
Output Torque(lb-ft)	-1468	-1468	-1448	-1453	-1423
FD Output Speed(rpm)	117	118	124	117	118
FD Input Speed (rpm)	1206	1210	1211	1211	1211
Pump Speed (rpm)	2208	2207	2208	2207	2207
Pump P Pressure(psi)	2146	2153	2137	2136	2117
Pump S Pressure(psi)	343	345	345	342	345
Pump Control Volt(V)	7.8	7.8	7.8	7.8	7.8
Ambient (oF)	73	73	73	73	74
Temp into F.D. (oF)		167			
Temp inside F.D.(oF)		179			

Test Engineer: Nadine Barr  
 Date: 09:13:84  
 Final Drive S/N 2  
 Run No. 13

	10:07:25	10:10:04	10:15:05	10:20:00	10:25:03
FD Output Power (hp)	-34	-32	-30	-32	-31
Output Torque(lb-ft)	-850	-814	-789	-801	-783
FD Output Speed(rpm)	211	208	202	207	208
FD Input Speed (rpm)	2143	2135	2121	2120	2115
Pump Speed (rpm)	2207	2206	2206	2208	2207
Pump P Pressure(psi)	2495	2439	2385	2392	2369
Pump S Pressure(psi)	339	337	337	335	332
Pump Control Volt(V)	12.1	12.0	12.0	12.0	12.0
Ambient (oF)	75	74	74	74	75
Temp into F.D. (oF)		169			162
Temp inside F.D.(oF)		194			190

	10:30:04	10:35:00	10:40:04	10:45:01	10:50:06
FD Output Power (hp)	-31	-31	-31	-31	-30
Output Torque(lb-ft)	-782	-796	-792	-7699	-784
FD Output Speed(rpm)	208	203	204	209	202
FD Input Speed (rpm)	*2179	2112	2112	2112	2111
Pump Speed (rpm)	2208	2207	2208	2207	2206
Pump P Pressure(psi)	2332	2362	2343	2326	2337
Pump S Pressure(psi)	337	334	336	334	334
Pump Control Volt(V)	12.0	12.0	12.0	12.0	12.0
Ambient (oF)	75	75	75	75	75
Temp into F.D. (oF)					163
Temp inside F.D.(oF)					190

	10:55:06	11:00:05	11:05:07	11:10:02	11:15:05
FD Output Power (hp)	-32	-32	-31	-32	-32
Output Torque(lb-ft)	-751	-750	-734	-744	-733
FD Output Speed(rpm)	227	220	223	224	229
FD Input Speed (rpm)	2318	2313	2294	2304	2305
Pump Speed (rpm)	2206	2207	2207	2207	2207
Pump P Pressure(psi)	2522	2460	2438	2440	2419
Pump S Pressure(psi)	336	325	324	326	322
Pump Control Volt(V)	12.6	12.6	12.6	12.6	12.6
Ambient (oF)	76	75	76	77	77
Temp into F.D. (oF)					165
Temp inside F.D.(oF)					197

\* Input Speed Calculated

Test Engineer: DAVID RAYMOND

Date: 09:14:84

Final Drive S/N 2

Run No. 14

	10:41:22	10:41:40	10:42:11	10:42:20	10:42:39
FD Output Power (hp)	0	0	0	0	0
Output Torque(lb-ft)	-14	-14	-14	-14	-14
FD Output Speed(rpm)	0	0	0	0	0
FD Input Speed (rpm)	0	0	0	0	0
Pump Speed (rpm)	0	0	0	0	0
Pump P Pressure(psi)	3239	3249	3244	3242	3250
Pump S Pressure(psi)	2479	2479	2479	2479	2479
Pump Control Volt(V)	0.1	0.1	0.1	0.1	0.1
Ambient (oF)	77	77	76	76	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:42:47	10:43:05	10:56:58	11:00:06	11:05:08
FD Output Power (hp)	0	0	-0	-0	-90
Output Torque(lb-ft)	-14	-14	-13	-12	-4727
FD Output Speed(rpm)	0	0	131	145	*101
FD Input Speed (rpm)	0	0	0	0	1067
Pump Speed (rpm)	0	0	2210	2215	2186
Pump P Pressure(psi)	3243	3242	510	496	4920
Pump S Pressure(psi)	2479	2479	421	410	338
Pump Control Volt(V)	0.1	0.1	0.1	0.1	7.2
Ambient (oF)	76	76	77	77	78
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:10:02	11:15:05	11:20:04	11:25:07	11:30:01
FD Output Power (hp)	-77	-90	-94	-93	-98
Output Torque(lb-ft)	-3964	-2349	-2414	-2327	-2289
FD Output Speed(rpm)	*101	201	205	209	202
FD Input Speed (rpm)	1095	2051	2061	2061	2067
Pump Speed (rpm)	2191	2189	2191	2194	2197
Pump P Pressure(psi)	4063	4790	4926	4885	4725
Pump S Pressure(psi)	320	296	298	301	298
Pump Control Volt(V)	7.6	12.8	13.2	13.2	13.2
Ambient (oF)	78	78	79	80	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated

Test Engineer: DAVID RAYMOND

Date: 09:14:84

Final Drive S/N 2

Run No. 15

	12:55:15	13:00:00	13:05:04	13:10:06	13:15:01
FD Output Power (hp)	0	0	-84	-89	-92
Output Torque(lb-ft)	6	7	-1544	-1615	-1593
FD Output Speed(rpm)	0	0	287	291	304
FD Input Speed (rpm)	0	0	3007	3051	3189
Pump Speed (rpm)	0	2183	2177	2190	2198
Pump P Pressure(psi)	5	498	5625	5815	6051
Pump S Pressure(psi)	3	410	323	287	249
Pump Control Volt(V)	0.5	0.5	13.9	14.9	15.4
Ambient (oF)	81	81	81	82	82
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:20:01	13:25:04	13:26:44	13:31:47	13:36:41
FD Output Power (hp)	-60	-91	-92	-92	-89
Output Torque(lb-ft)	-1737	-2485	-2465	-2478	-2397
FD Output Speed(rpm)	180	193	196	196	196
FD Input Speed (rpm)	1833	2014	2051	2051	2053
Pump Speed (rpm)	2190	2201	2203	2203	2205
Pump P Pressure(psi)	3973	4944	5121	5001	4819
Pump S Pressure(psi)	340	300	297	307	292
Pump Control Volt(V)	11.6	12.9	13.1	13.1	13.2
Ambient (oF)	83	82	82	83	82
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:41:40	13:46:44	13:51:44	13:56:45	14:00:06
FD Output Power (hp)	-91	-89	-89	-12	-24
Output Torque(lb-ft)	-2474	-2429	-2415	-284	-663
FD Output Speed(rpm)	194	193	193	219	187
FD Input Speed (rpm)	2030	2025	2054	2294	1931
Pump Speed (rpm)	2204	2208	2220	2169	2077
Pump P Pressure(psi)	4918	4902	4537	1675	2817
Pump S Pressure(psi)	300	301	279	312	351
Pump Control Volt(V)	13.2	13.2	13.3	12.5	12.5
Ambient (oF)	82	81	81	81	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:05:06	14:10:05	14:15:04	14:20:05	14:25:01
FD Output Power (hp)	-61	-2	-14	41	92
Output Torque(lb-ft)	-1648	-45	-247	426	1045
FD Output Speed(rpm)	194	227	298	506	462
FD Input Speed (rpm)	2034	2375	1391	2265	2071
Pump Speed (rpm)	2266	2300	2337	2282	2277
Pump P Pressure(psi)	1970	1016	904	391	376
Pump S Pressure(psi)	328	342	349	3355	4068
Pump Control Volt(V)	12.6	12.1	10.6	13.5	13.5
Ambient (oF)	81	81	81	81	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:30:07	14:35:05	14:36:25	14:38:02	14:40:06
FD Output Power (hp)	89	89	90	87	-6
Output Torque(lb-ft)	1038	1038	1061	1051	-2809
FD Output Speed(rpm)	448	449	446	442	10
FD Input Speed (rpm)	2010	2010	1999	1981	7
Pump Speed (rpm)	2279	2280	2281	2281	2316
Pump P Pressure(psi)	371	359	363	366	473
Pump S Pressure(psi)	4055	4041	4042	4027	391
Pump Control Volt(V)	13.6	13.8	13.9	13.9	-0.0
Ambient (oF)	81	81	81	81	81
Temp into F.D. (oF)					
Temp inside F.D. (oF)					

Test Engineer: DAVID RAYMOND

Date: 09:17:84

Final Drive S/N 2

Run No. 16

	09:39:21	09:40:04	09:45:05	09:50:05	10:11:46
FD Output Power (hp)	0	0	0	0	0
Output Torque(lb-ft)	-28	-28	-28	-29	-12
FD Output Speed(rpm)	0	0	0	0	0
FD Input Speed (rpm)	0	0	0	0	0
Pump Speed (rpm)	0	0	2206	2217	0
Pump P Pressure(psi)	3245	3245	3761	495	10
Pump S Pressure(psi)	2430	2481	2905	407	7
Pump Control Volt(V)	0.0	0.0	-0.0	0.0	-0.0
Ambient (oF)	74	74	74	74	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:15:03	10:25:53	10:30:03	10:35:05	10:40:02
FD Output Power (hp)	0	0	0	0	0
Output Torque(lb-ft)	-15	-32	-14	-14	-17
FD Output Speed(rpm)	0	0	0	0	0
FD Input Speed (rpm)	0	0	0	0	0
Pump Speed (rpm)	2198	2216	1103	0	0
Pump P Pressure(psi)	513	509	439	7	7
Pump S Pressure(psi)	423	419	364	6	7
Pump Control Volt(V)	-0.0	-0.0	-0.0	-0.0	-0.0
Ambient (oF)	76	76	76	77	77
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:45:00	10:50:04	10:55:00	14:05:24	14:10:04
FD Output Power (hp)	0	0	0	0	0
Output Torque(lb-ft)	-18	2	4	5	5
FD Output Speed(rpm)	0	0	0	0	0
FD Input Speed (rpm)	0	0	0	0	0
Pump Speed (rpm)	0	2223	0	0	2206
Pump P Pressure(psi)	9	499	8	8	489
Pump S Pressure(psi)	6	412	6	5	403
Pump Control Volt(V)	-0.0	-0.0	-0.0	-0.0	-0.0
Ambient (oF)	78	78	78	84	84
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:15:08	14:20:05	14:50:37	14:51:57	14:44:59
FD Output Power (hp)	9	0	0	0	0
Output Torque(lb-ft)	227	-14	-0	-1	-1
FD Output Speed(rpm)	215	0	0	0	0
FD Input Speed (rpm)	2246	0	0	0	0
Pump Speed (rpm)	2197	2217	0	0	0
Pump P Pressure(psi)	410	467	7	8	9
Pump S Pressure(psi)	1492	387	3	3	3
Pump Control Volt(V)	12.2	-0.0	-0.0	-0.0	-0.0
Ambient (oF)	84	85	85	86	85
Temp into F.D. (oF)					
Temp inside F.D.(oF)					



Test Engineers: Nadine Barr

Date: 09:18:84

Final Drive S/N 2

Run No. 17

	13:08:07	13:10:01	13:15:03	13:20:00	13:25:03
FD Output Power (hp)	0	0	0	-16	-16
Output Torque(lb-ft)	11	11	38	-325	-318
FD Output Speed(rpm)	0	0	0	260	256
FD Input Speed (rpm)	0	0	0	1164	1149
Pump Speed (rpm)	0	423	2211	2200	2204
Pump P Pressure(psi)	10	397	491	1995	1864
Pump S Pressure(psi)	6	330	408	375	374
Pump Control Volt(V)	-0.0	-0.0	0.1	7.2	7.2
Ambient (oF)	94	84	85	86	86
Temp into F.D. (oF)				166	
Temp inside F.D.(oF)				177	

	13:30:02	13:35:06	13:40:01	13:45:04	13:50:08
FD Output Power (hp)	-16	-19	-18	-31	-30
Output Torque(lb-ft)	-317	-329	-332	-399	-390
FD Output Speed(rpm)	260	297	292	409	408
FD Input Speed (rpm)	1167	1331	1308	1833	1828
Pump Speed (rpm)	2207	2207	2211	2204	2207
Pump P Pressure(psi)	1839	2037	2004	2828	2774
Pump S Pressure(psi)	373	366	369	362	362
Pump Control Volt(V)	7.5	8.2	8.2	10.5	10.5
Ambient (oF)	87	87	87	88	88
Temp into F.D. (oF)			164		
Temp inside F.D.(oF)			181		

	13:55:07	14:00:03	14:05:05	14:10:06	14:15:00
FD Output Power (hp)	-41	-19	-19	-28	-29
Output Torque(lb-ft)	-434	-317	-316	-369	-371
FD Output Speed(rpm)	498	307	309	405	404
FD Input Speed (rpm)	2229	1377	1385	1813	1810
Pump Speed (rpm)	2204	2215	2217	2213	2212
Pump P Pressure(psi)	3698	1969	1983	2645	2627
Pump S Pressure(psi)	360	365	365	364	360
Pump Control Volt(V)	11.8	8.3	8.3	10.4	10.4
Ambient (oF)	88	88	88	88	89
Temp into F.D. (oF)	165				
Temp inside F.D.(oF)	189				

	14:20:00	14:25:03	14:29:20	09:48:01	09:52:19
FD Output Power (hp)	-11	-14	0	0	0
Output Torque(lb-ft)	-231	-287	-7	16	16
FD Output Speed(rpm)	253	261	0	0	0
FD Input Speed (rpm)	1130	1171	0	0	0
Pump Speed (rpm)	2219	2222	0	0	0
Pump P Pressure(psi)	1659	1639	10	5	2
Pump S Pressure(psi)	363	364	5	5	4
Pump Control Volt(V)	7.0	7.0	-0.0	-0.0	-0.0
Ambient (oF)	88	89	89	76	78
Temp into F.D. (oF)		161			
Temp inside F.D.(oF)		180			

Test Engineer: MADINE BARR

Date: 09:19:84

Final Drive S/N 2

Run No. 18

	08:16:55	08:17:05	08:20:02	08:25:05	08:30:07
FD Output Power (hp)	0	0	0	0	91
Output Torque(lb-ft)	-14	-14	-14	-14	1268
FD Output Speed(rpm)	0	0	0	0	375
FD Input Speed (rpm)	0	0	0	0	1652
Pump Speed (rpm)	0	0	0	2221	2191
Pump P Pressure(psi)	14	14	13	523	465
Pump S Pressure(psi)	8	3	8	430	4749
Pump Control Volt(V)	-0.0	-0.0	-0.0	-0.0	9.8
Ambient (oF)	73	73	73	73	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	08:35:04	08:40:01	08:45:09	08:50:06	08:55:03
FD Output Power (hp)	89	91	87	91	14
Output Torque(lb-ft)	1232	1241	1524	1623	281
FD Output Speed(rpm)	375	385	301	294	257
FD Input Speed (rpm)	1681	1723	1349	1321	1151
Pump Speed (rpm)	2194	2194	2197	2199	2222
Pump P Pressure(psi)	461	450	452	445	455
Pump S Pressure(psi)	4479	4597	4158	3986	1437
Pump Control Volt(V)	10.2	10.8	9.0	9.0	7.4
Ambient (oF)	75	76	75	75	76
Temp into F.D. (oF)	164			-165	
Temp inside F.D.(oF)	196			187	

	09:00:07	09:05:05	09:10:08	09:15:01	09:20:01
FD Output Power (hp)	14	40	11	11	0
Output Torque(lb-ft)	281	419	245	256	4
FD Output Speed(rpm)	258	502	231	233	0
FD Input Speed (rpm)	1155	2248	1036	1045	0
Pump Speed (rpm)	2225	2211	2232	2229	2238
Pump P Pressure(psi)	455	456	459	459	496
Pump S Pressure(psi)	1460	3273	1268	1343	408
Pump Control Volt(V)	7.4	12.2	7.0	7.0	-0.0
Ambient (oF)	76	77	77	77	77
Temp into F.D. (oF)	--			160	
Temp inside F.D.(oF)	218			190	

	09:25:03	09:30:08	09:35:02	09:40:05	09:45:02
FD Output Power (hp)	64	63	-57	-16	0
Output Torque(lb-ft)	1725	1716	-1544	-793	-16
FD Output Speed(rpm)	195	193	194	109	0
FD Input Speed (rpm)	2037	2021	2030	623	0
Pump Speed (rpm)	2213	2213	2215	2293	2121
Pump P Pressure(psi)	457	449	3434	7423	681
Pump S Pressure(psi)	3000	2963	377	348	386
Pump Control Volt(V)	11.4	11.4	12.3	12.8	0.3
Ambient (oF)	78	76	78	78	79
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: MADINE BARR

Date: 09: 19: 84

Final Drive S/N 2

Run No. 19

	13:31:19	13:35:07	13:40:05	13:45:01	14:46:12
FD Output Power (hp)	0	17	16	0	-29
Output Torque(lb-ft)	-11	299	289	-16	-360
FD Output Speed(rpm)	0	308	290	0	404
FD Input Speed (rpm)	0	1330	1301	0	1811
Pump Speed (rpm)	2232	2217	2223	0	2198
Pump P Pressure(psi)	762	706	702	226	3515
Pump S Pressure(psi)	455	2598	2081	1	409
Pump Control Volt(V)	-0.0	7.9	7.9	-0.0	9.5
Ambient (oF)	80	81	81	81	82
Temp into F.D. (oF)		148			
Temp inside F.D.(oF)		173			

	14:50:03	14:55:06	15:00:00	15:05:06	15:10:03
FD Output Power (hp)	-96	-66	-92	-89	-93
Output Torque(lb-ft)	-1253	-1211	-1204	-1212	-1206
FD Output Speed(rpm)	403	371	402	386	407
FD Input Speed (rpm)	1807	1664	1802	1729	1821
Pump Speed (rpm)	2194	2199	2199	2201	2266
Pump P Pressure(psi)	6151	5318	5716	5420	5616
Pump S Pressure(psi)	372	366	363	350	357
Pump Control Volt(V)	10.6	10.6	16.6	21.0	25.6
Ambient (oF)	82	82	82	81	81
Temp into F.D. (oF)	170				
Temp inside F.D.(oF)	205				

	15:15:03	15:20:09	09:10:08	09:15:01	09:20:04
FD Output Power (hp)	-88	0	11	11	0
Output Torque(lb-ft)	-968	-13	245	256	4
FD Output Speed(rpm)	479	0	231	233	0
FD Input Speed (rpm)	2179	0	1036	1045	0
Pump Speed (rpm)	2265	0	2232	2229	2238
Pump P Pressure(psi)	7315	-0	459	459	496
Pump S Pressure(psi)	252	-0	1268	1343	408
Pump Control Volt(V)	15.9	0.0	7.0	7.0	-0.0
Ambient (oF)	81	81	77	77	77
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Madine Barr

Date: 09-28-84

Final Drive S/N 2

Run No. 20

	09:06:25	09:10:05	09:15:05	09:20:04	09:54:37
FD Output Power (hp)	-77	-61	-62	-61	-64
Output Torque(lb-ft)	-642	-591	-606	-594	-1853
FD Output Speed(rpm)	634	544	539	543	191
FD Input Speed (rpm)	2848	2434	2417	2435	1890
Pump Speed (rpm)	2391	2416	2418	2411	2205
Pump P Pressure(psi)	7564	4699	4540	5154	3509
Pump S Pressure(psi)	370	387	364	398	383
Pump Control Volt(V)	12.8	11.6	12.8	13.4	10.1
Ambient (oF)	66	67	66	67	67
Temp into F.D. (oF)		165			
Temp inside F.D.(oF)		225			

	10:00:07	10:05:02	10:10:05	10:15:03	10:20:08
FD Output Power (hp)	-65	-63	-63	-63	-62
Output Torque(lb-ft)	-1880	-1824	-1831	-1820	-1807
FD Output Speed(rpm)	181	182	182	181	181
FD Input Speed (rpm)	1892	1911	1902	1901	1893
Pump Speed (rpm)	2206	2206	2206	2206	2205
Pump P Pressure(psi)	3588	3594	3566	3530	3517
Pump S Pressure(psi)	383	382	380	378	380
Pump Control Volt(V)	10.1	10.1	10.1	10.1	10.1
Ambient (oF)	68	68	68	68	68
Temp into F.D. (oF)		165			
Temp inside F.D.(oF)		191			

	10:25:00	10:30:01	10:35:02	10:40:02	10:45:06
FD Output Power (hp)	-62	-62	-90	-92	-91
Output Torque(lb-ft)	-1819	-1800	-2803	-2300	-2884
FD Output Speed(rpm)	180	108	169	166	166
FD Input Speed (rpm)	1882	1882	1775	1744	1737
Pump Speed (rpm)	2208	2209	2199	2200	2206
Pump P Pressure(psi)	3545	3479	4754	4863	4793
Pump S Pressure(psi)	378	379	373	372	367
Pump Control Volt(V)	10.1	10.1	10.1	10.1	10.1
Ambient (oF)	68	69	69	68	69
Temp into F.D. (oF)		167			
Temp inside F.D.(oF)		192			

	10:50:01	10:55:04	11:00:06	11:05:06	11:10:01
FD Output Power (hp)	-93	-92	-92	-122	-122
Output Torque(lb-ft)	-2958	-2940	-2931	-4248	-4295
FD Output Speed(rpm)	165	165	165	151	149
FD Input Speed (rpm)	1726	1727	1726	1583	1560
Pump Speed (rpm)	2203	2203	2204	2196	2193
Pump P Pressure(psi)	4825	4812	4809	6321	6265
Pump S Pressure(psi)	367	371	372	352	355
Pump Control Volt(V)	10.1	10.1	10.1	10.1	10.1
Ambient (oF)	69	67	68	68	68
Temp into F.D. (oF)	168				
Temp inside F.D.(oF)	197				

Date: 09/20/94

	11:15:03	11:20:04	11:25:01	11:30:00	11:32:04
FD Output Power (hp)	-121	-124	-63	-126	-123
Output Torque(lb-ft)	-4322	-4470	-544	-1549	-1516
FD Output Speed(rpm)	146	146	612	428	426
FD Input Speed (rpm)	1545	1526	2743	1917	1903
Pump Speed (rpm)	2195	2193	2450	2459	2453
Pump P Pressure(psi)	6263	6423	7660	6624	6738
Pump S Pressure(psi)	356	352	272	341	352
Pump Control Volt(V)	10.1	10.1	23.4	10.6	10.6
Ambient (oF)	67	68	68	68	68
Temp into F.D. (oF)	161				
Temp inside F.D.(oF)	196				

	11:33:21	11:35:06	11:36:06	11:40:00	11:45:00
FD Output Power (hp)	-125	-122	-120	0	0
Output Torque(lb-ft)	-1541	-1523	-1433	0	0
FD Output Speed(rpm)	425	421	440	0	0
FD Input Speed (rpm)	1906	1884	2003	0	0
Pump Speed (rpm)	2460	2461	2472	0	0
Pump P Pressure(psi)	6745	6590	5642	0	0
Pump S Pressure(psi)	336	344	352	0	0
Pump Control Volt(V)	10.6	10.6	10.6	0.0	0.2
Ambient (oF)	68	69	69	0	0
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr

Date: 09:28:84

Final Drive S/N 2

Run No. 21

	12:28:03	12:30:00	12:31:08	12:35:05	12:37:01
FD Output Power (hp)	-20	-29	-37	-32	-32
Output Torque(lb-ft)	-328	-417	-517	-431	-429
FD Output Speed(rpm)	326	357	371	393	393
FD Input Speed (rpm)	1462	1600	1663	1760	1759
Pump Speed (rpm)	2221	2215	2212	2208	2210
Pump P Pressure(psi)	2511	2782	2997	2958	2920
Pump S Pressure(psi)	390	390	385	360	390
Pump Control Volt(V)	8.1	8.8	9.1	9.5	9.5
Ambient (oF)	69	69	69	69	69
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	12:40:02	12:45:01	12:50:00	12:55:06	13:00:08
FD Output Power (hp)	-31	-32	-33	-32	-31
Output Torque(lb-ft)	-420	-378	-398	-381	-368
FD Output Speed(rpm)	391	445	442	440	439
FD Input Speed (rpm)	1752	1993	1978	1971	1965
Pump Speed (rpm)	2211	2207	2208	2211	2210
Pump P Pressure(psi)	0	3245	3180	3124	3123
Pump S Pressure(psi)	383	382	381	373	377
Pump Control Volt(V)	9.5	10.4	10.4	10.4	10.4
Ambient (oF)	68	68	69	70	70
Temp into F.D. (oF)			167		
Temp inside F.D.(oF)			209		

	13:05:02	13:10:02	13:15:05	13:20:04	13:26:04
FD Output Power (hp)	-31	-30	-30	-31	-31
Output Torque(lb-ft)	-371	-360	-363	-367	-369
FD Output Speed(rpm)	437	437	438	438	438
FD Input Speed (rpm)	1960	1958	1962	1963	1963
Pump Speed (rpm)	2211	2210	2212	2213	2214
Pump P Pressure(psi)	3040	3065	3056	3086	3053
Pump S Pressure(psi)	376	381	376	385	378
Pump Control Volt(V)	10.3	10.3	10.3	10.3	10.3
Ambient (oF)	71	71	71	69	71
Temp into F.D. (oF)			164		
Temp inside F.D.(oF)			206		

Test Engineer: Nadine Barr  
 Date: 89:22:84  
 Final Drive S/N 2  
 Run No. 22

	14:15:01	14:16:45	14:18:46	14:20:00	14:25:02
FD Output Power (hp)	-21	-30	-29	-29	-61
Output Torque(lb-ft)	-259	-375	-367	-368	-816
FD Output Speed(rpm)	435	426	419	416	390
FD Input Speed (rpm)	1939	1903	1875	1866	1742
Pump Speed (rpm)	2269	2271	2273	2275	2269
Pump P Pressure(psi)	3064	3091	2956	2915	4088
Pump S Pressure(psi)	393	388	389	390	380
Pump Control Volt(V)	9.5	9.5	9.5	9.5	9.5
Ambient (oF)	75	75	76	76	76
Temp into F.D. (oF)	170				
Temp inside F.D.(oF)	207				

	14:30:04	14:35:05	14:40:08	14:45:04	14:50:06
FD Output Power (hp)	-60	-59	-60	-62	-58
Output Torque(lb-ft)	-827	-815	-831	-767	-720
FD Output Speed(rpm)	382	381	376	426	425
FD Input Speed (rpm)	1711	1699	1687	1902	1902
Pump Speed (rpm)	2271	2276	2279	2279	2285
Pump P Pressure(psi)	3942	3852	3912	4205	4091
Pump S Pressure(psi)	372	376	373	371	368
Pump Control Volt(V)	9.5	9.5	9.5	10.4	10.4
Ambient (oF)	76	76	76	76	77
Temp into F.D. (oF)	175			165	
Temp inside F.D.(oF)	207			207	

	14:55:07	15:00:03	15:05:05	15:10:04	15:15:07
FD Output Power (hp)	-59	-59	-59	-61	-60
Output Torque(lb-ft)	-738	-734	-726	-759	-743
FD Output Speed(rpm)	423	422	424	425	424
FD Input Speed (rpm)	1896	1892	1895	1893	1900
Pump Speed (rpm)	2288	2290	2293	2294	2296
Pump P Pressure(psi)	4135	4095	4070	4164	4131
Pump S Pressure(psi)	367	372	374	371	370
Pump Control Volt(V)	10.4	10.4	10.4	10.4	10.4
Ambient (oF)	77	77	77	77	77
Temp into F.D. (oF)		165			164
Temp inside F.D.(oF)		208			220

	15:20:01	15:25:04	15:30:08	15:35:04	15:40:07
FD Output Power (hp)	-61	-63	-63	-61	-62
Output Torque(lb-ft)	-643	-751	-749	-733	-732
FD Output Speed(rpm)	498	439	440	440	442
FD Input Speed (rpm)	2233	1967	1969	1971	1976
Pump Speed (rpm)	2292	2297	2299	2301	2300
Pump P Pressure(psi)	4700	4329	4310	4282	4284
Pump S Pressure(psi)	362	365	369	366	370
Pump Control Volt(V)	11.4	10.5	10.5	10.5	10.5
Ambient (oF)	77	77	77	77	78
Temp into F.D. (oF)			166		
Temp inside F.D.(oF)			213		

Test Engineer: Nadine Barr  
 Date: 09:26:84  
 Final Drive S/N 2  
 Run No. 23

	08:49:09	08:50:06	08:58:27	09:00:05	09:05:16
FD Output Power (hp)	-18	-9	-55	-65	-60
Output Torque(lb-ft)	-1015	-295	-1034	-1015	-1001
FD Output Speed(rpm)	225	336	326	336	315
FD Input Speed (rpm)	972	1399	1459	1495	1475
Pump Speed (rpm)	2164	2155	2155	2157	2162
Pump P Pressure(psi)	2633	2824	4116	4002	3853
Pump S Pressure(psi)	403	400	384	382	376
Pump Control Volt(V)	6.4	7.4	8.5	8.5	8.5
Ambient (oF)	69	69	70	70	71
Temp into F.D. (oF)					167
Temp inside F.D.(oF)					193

	09:10:04	09:15:05	09:20:01	09:25:03	09:30:05
FD Output Power (hp)	-58	-117	-118	-74	18
Output Torque(lb-ft)	-975	-2091	-2240	-1395	364
FD Output Speed(rpm)	*310	*294	277	277	263
FD Input Speed (rpm)	1389	1315	1188	1241	1167
Pump Speed (rpm)	2166	2152	2153	2166	2178
Pump P Pressure(psi)	3773	6087	6211	4140	1495
Pump S Pressure(psi)	378	361	359	363	364
Pump Control Volt(V)	6.5	8.5	8.5	8.5	7.6
Ambient (oF)	72	72	73	73	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	09:35:03	09:40:02	09:45:00	09:50:03	09:55:03
FD Output Power (hp)	0	20	21	21	23
Output Torque(lb-ft)	1546	338	338	327	341
FD Output Speed(rpm)	0	317	327	332	359
FD Input Speed (rpm)	0	1424	1458	1490	1500
Pump Speed (rpm)	2199	2182	2185	2185	2185
Pump P Pressure(psi)	889	447	458	456	453
Pump S Pressure(psi)	362	1719	1750	1791	1820
Pump Control Volt(V)	-0.0	9.1	9.1	9.1	9.1
Ambient (oF)	74	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:00:00	10:05:01	10:10:02	10:15:02	10:20:03
FD Output Power (hp)	29	30	36	26	27
Output Torque(lb-ft)	356	368	395	349	347
FD Output Speed(rpm)	425	428	474	388	410
FD Input Speed (rpm)	1821	1912	2117	1740	1740
Pump Speed (rpm)	2181	2182	2181	2185	2181
Pump P Pressure(psi)	455	449	464	451	452
Pump S Pressure(psi)	2321	2498	2867	2137	2123
Pump Control Volt(V)	10.6	11.0	11.7	10.0	10.0
Ambient (oF)	74	74	75	74	75
Temp into F.D. (oF)				166	
Temp inside F.D.(oF)				228	

\* Input Speed Calculated



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	10:25:01	10:30:03	10:35:05	10:40:00	10:45:00
FD Output Power (hp)	25	27	4	6	10
Output Torque(lb-ft)	342	350	195	257	276
FD Output Speed(rpm)	399	409	113	130	194
FD Input Speed (rpm)	1743	1748	1182	*1362	*2032
Pump Speed (rpm)	2182	2185	2198	2191	2190
Pump P Pressure(psi)	455	453	464	467	465
Pump S Pressure(psi)	2128	2159	783	1219	1257
Pump Control Volt(V)	10.0	10.0	7.8	11.3	11.3
Ambient (oF)	75	75	75	75	75
Temp into F.D. (oF)			163		
Temp inside F.D.(oF)			182		

	10:50:01	10:55:04	11:00:01	11:05:01	11:10:02
FD Output Power (hp)	11	89	92	49	95
Output Torque(lb-ft)	274	1099	1197	856	1808
FD Output Speed(rpm)	209	424	405	303	275
FD Input Speed (rpm)	2177	1901	1813	1353	1233
Pump Speed (rpm)	2189	2167	2167	2179	2169
Pump P Pressure(psi)	458	444	454	451	433
Pump S Pressure(psi)	1240	4658	4029	2824	4254
Pump Control Volt(V)	11.3	11.5	11.5	8.5	8.9
Ambient (oF)	75	75	76	76	76
Temp into F.D. (oF)			162		
Temp inside F.D.(oF)			215		

	11:15:03	11:19:06	11:19:02	11:19:15	11:20:05
FD Output Power (hp)	93	90	-1	89	34
Output Torque(lb-ft)	1738	863	-21	859	423
FD Output Speed(rpm)	282	546	233	546	419
FD Input Speed (rpm)	1264	2441	2445	2444	1871
Pump Speed (rpm)	2169	2210	2210	2210	2232
Pump P Pressure(psi)	449	419	424	415	440
Pump S Pressure(psi)	4176	5745	5736	5687	2882
Pump Control Volt(V)	8.9	13.9	13.9	13.9	11.1
Ambient (oF)	76	76	76	76	76
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:25:03	11:30:05	11:35:01	11:35:39	12:30:01
FD Output Power (hp)	29	92	0	0	0
Output Torque(lb-ft)	384	1260	16	15	1
FD Output Speed(rpm)	403	384	0	0	0
FD Input Speed (rpm)	1807	1680	0	0	0
Pump Speed (rpm)	2235	2224	0	0	0
Pump P Pressure(psi)	448	441	8	5	-0
Pump S Pressure(psi)	2253	4268	6	8	0
Pump Control Volt(V)	10.4	10.4	-0.0	-0.0	0.0
Ambient (oF)	76	76	76	76	81
Temp into F.D. (oF)		160			
Temp inside F.D.(oF)		208			

\* Input Speed Calculated

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	13:00:00	13:00:48	13:04:12	13:08:22	13:12:30
FD Output Power (hp)	-124	-121	-122	-120	-123
Output Torque(lb-ft)	-1461	-1421	-1377	-1690	-1745
FD Output Speed(rpm)	446	449	466	374	371
FD Input Speed (rpm)	1936	*2007	2030	1676	1659
Pump Speed (rpm)	2384	2389	2388	2392	2394
Pump P Pressure(psi)	7073	6711	6860	6298	6427
Pump S Pressure(psi)	363	359	342	336	352
Pump Control Volt(V)	10.9	10.9	11.5	10.1	10.1
Ambient (oF)	77	77	78	78	78
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:55	13:15:02	13:21:42	13:26:44	13:31:40
FD Output Power (hp)	-128	-124	34	33	32
Output Torque(lb-ft)	-1765	-1752	602	537	524
FD Output Speed(rpm)	382	370	299	320	325
FD Input Speed (rpm)	1653	1660	1341	1371	1397
Pump Speed (rpm)	2395	2398	2426	2428	2426
Pump P Pressure(psi)	6476	6501	459	461	460
Pump S Pressure(psi)	353	351	2080	1954	1975
Pump Control Volt(V)	10.1	10.1	8.1	8.1	8.1
Ambient (oF)	79	79	79	79	79
Temp into F.D. (oF)	164				
Temp inside F.D.(oF)	203				

	13:36:44	13:41:42	13:46:42	13:51:46	14:00:03
FD Output Power (hp)	31	29	34	46	6
Output Torque(lb-ft)	520	366	393	1724	230
FD Output Speed(rpm)	316	395	454	140	143
FD Input Speed (rpm)	1413	1774	2029	877	1499
Pump Speed (rpm)	2425	2542	2710	2717	2733
Pump P Pressure(psi)	464	470	467	470	470
Pump S Pressure(psi)	1959	2043	2365	3360	999
Pump Control Volt(V)	8.1	9.1	9.6	6.2	8.1
Ambient (oF)	80	80	80	80	80
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:05:00	14:10:02	14:15:05	14:20:01	14:25:00
FD Output Power (hp)	6	124	128	123	122
Output Torque(lb-ft)	292	6524	6733	6563	6528
FD Output Speed(rpm)	189	100	100	98	98
FD Input Speed (rpm)	1977	1049	1045	1031	1031
Pump Speed (rpm)	2728	2700	2695	2693	2698
Pump P Pressure(psi)	475	460	446	454	450
Pump S Pressure(psi)	1067	5227	5291	5164	5127
Pump Control Volt(V)	9.5	7.2	7.2	7.2	7.2
Ambient (oF)	80	80	80	80	80
Temp into F.D. (oF)				166	
Temp inside F.D.(oF)				193	

\* Input Speed Calculated

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	14:30:00	14:35:05	14:40:03	14:45:03	14:50:05
FD Output Power (hp)	36	33	33	33	120
Output Torque(lb-ft)	1130	1007	1018	1011	3220
FD Output Speed(rpm)	166	170	172	173	195
FD Input Speed (rpm)	1744	1782	1794	1810	2045
Pump Speed (rpm)	2723	2724	2723	2727	2709
Pump P Pressure(psi)	473	474	473	473	460
Pump S Pressure(psi)	1621	1565	1589	1599	4064
Pump Control Volt(V)	8.7	8.7	8.7	8.7	10.5
Ambient (oF)	81	81	81	81	81
Temp into F.D. (oF)				165	
Temp inside F.D.(oF)				186	

	14:51:46	14:53:20	14:55:06	15:00:06	15:03:21
FD Output Power (hp)	119	117	117	116	115
Output Torque(lb-ft)	3205	3178	3191	3178	3170
FD Output Speed(rpm)	195	194	193	191	190
FD Input Speed (rpm)	2040	2030	2017	2000	1995
Pump Speed (rpm)	2708	2710	2711	2712	2714
Pump P Pressure(psi)	453	458	462	455	455
Pump S Pressure(psi)	4031	4032	3977	3956	3916
Pump Control Volt(V)	10.5	10.5	10.5	10.5	10.5
Ambient (oF)	81	81	81	81	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:04:43	15:10:05	15:13:24	15:16:43	15:20:02
FD Output Power (hp)	32	32	32	19	29
Output Torque(lb-ft)	787	785	779	396	481
FD Output Speed(rpm)	212	214	218	247	312
FD Input Speed (rpm)	2218	2244	2281	1106	1399
Pump Speed (rpm)	2741	2735	2733	2727	2737
Pump P Pressure(psi)	468	474	476	482	478
Pump S Pressure(psi)	1609	1638	1658	2213	1940
Pump Control Volt(V)	10.5	10.5	10.5	7.4	7.8
Ambient (oF)	81	81	81	81	81
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:23:24	15:26:43	15:30:03	15:33:25	15:36:41
FD Output Power (hp)	30	30	30	30	30
Output Torque(lb-ft)	503	504	494	499	492
FD Output Speed(rpm)	314	316	316	319	318
FD Input Speed (rpm)	1407	1412	1416	1421	1420
Pump Speed (rpm)	2736	2730	2737	2739	2735
Pump P Pressure(psi)	475	483	476	473	476
Pump S Pressure(psi)	1994	2015	2004	1961	1984
Pump Control Volt(V)	7.8	7.8	7.8	7.8	7.6
Ambient (oF)	81	81	81	81	82
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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	15:40:04	15:43:22	15:44:34	15:50:00	15:55:00
FD Output Power (hp)	30	30	29	0	0
Output Torque(lb-ft)	500	499	474	0	0
FD Output Speed(rpm)	319	319	319	0	0
FD Input Speed (rpm)	1429	1432	1431	0	0
Pump Speed (rpm)	2737	2739	2737	0	0
Pump P Pressure(psi)	476	472	475	0	0
Pump S Pressure(psi)	1946	2006	1958	0	0
Pump Control Volt(V)	7.8	7.8	7.8	0.0	0.0
Ambient (oF)	82	81	82	0	0
Temp into F.D. (oF)					
Temp inside F.D. (oF)					

FINAL DRIVE

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Table 9. S/N 003

This sheet is a summarization of the functional test conducted in accordance with this test plan.

PERCENT OF RATED POWER	DIRECTION	ACCUMULATED HOURS	ACTUAL POWER OUTPUT (H.P.)
0	FORWARD	2 hrs 32 min	0 - *
	REVERSE	2 hrs 42 min	"
25 $\pm$ 2%	FORWARD	3 hrs 32 min	31-35
	REVERSE	3 hrs 35 min	"
50 $\pm$ 2%	FORWARD	2 hrs 34 min	57-68
	REVERSE	2 hrs 30 min	"
75 $\pm$ 2%	FORWARD	60 min	91-97
	REVERSE	62 min	"
100 $\pm$ 2%	FORWARD	30 min	123-131
	REVERSE	33 min	"
TOTAL HOURS	FORWARD	10 hrs 8 min	—
	REVERSE	10 hrs 22 min	—

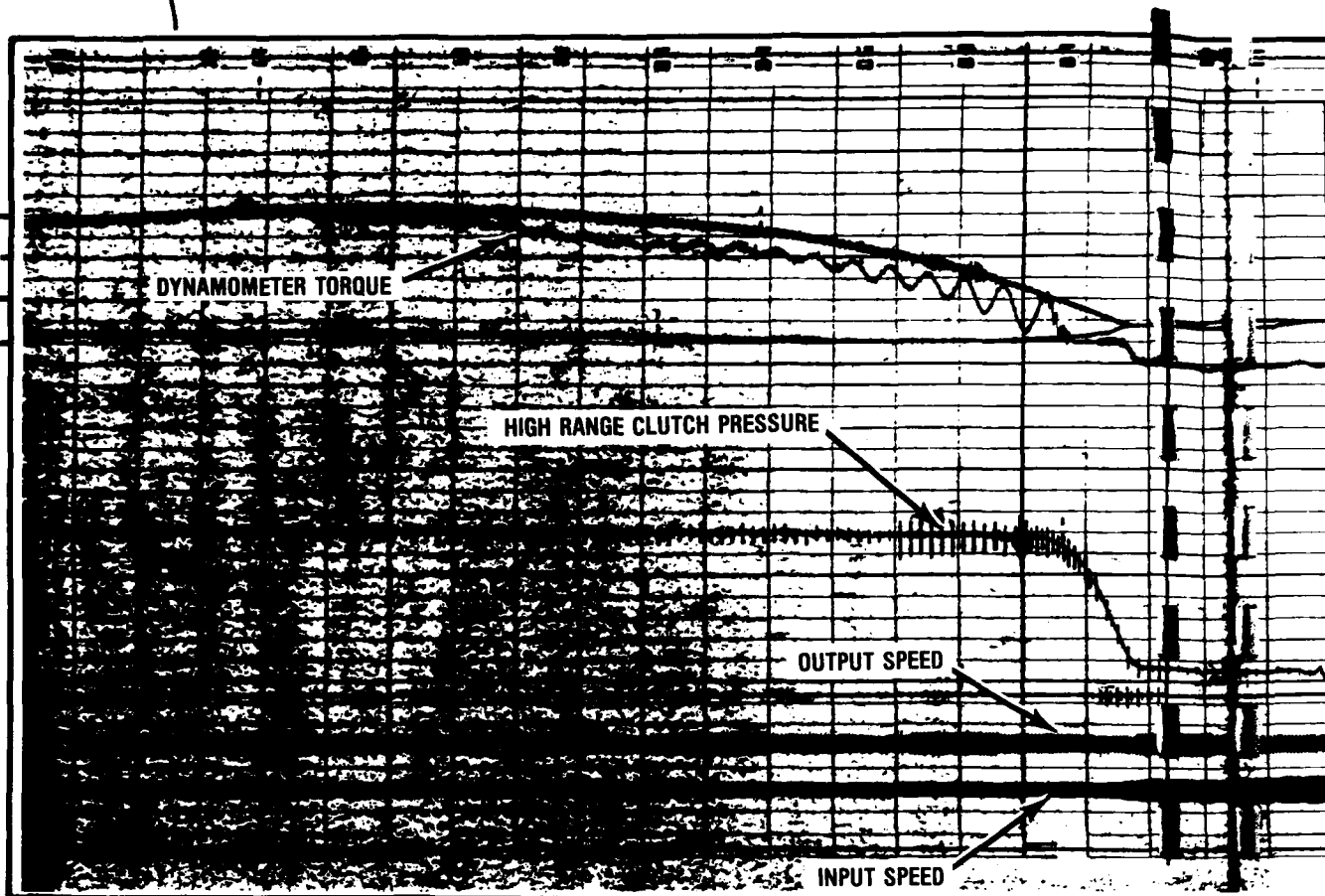
Accumulated hours are calculated from start/stop times recorded by the computer. Actual power outputs are calculated from the output speed and torque values recorded by the computer.

Total Shifts = 298

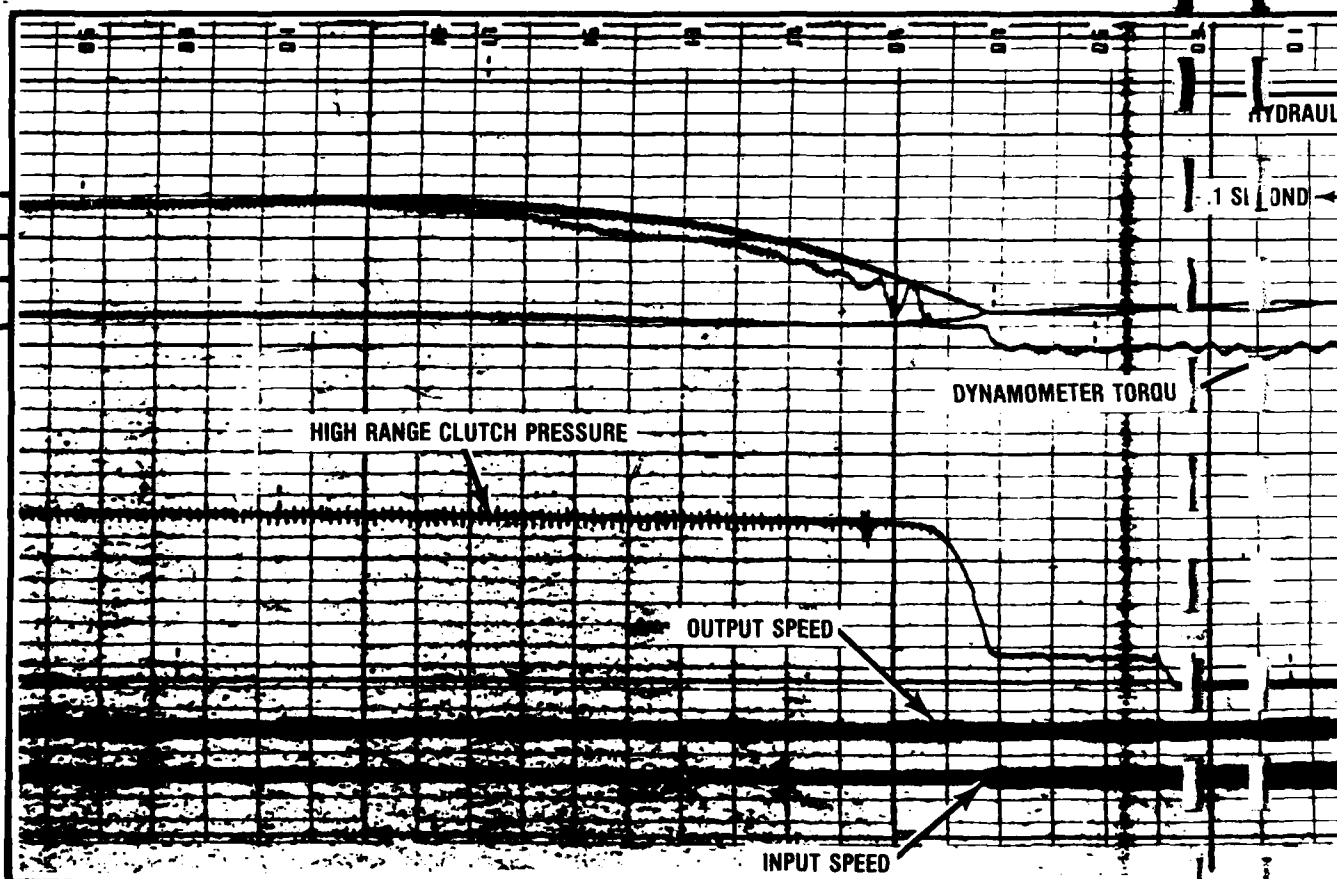
\* Actual H.P. depended on the minimum torque to turn the Duro at that speed.

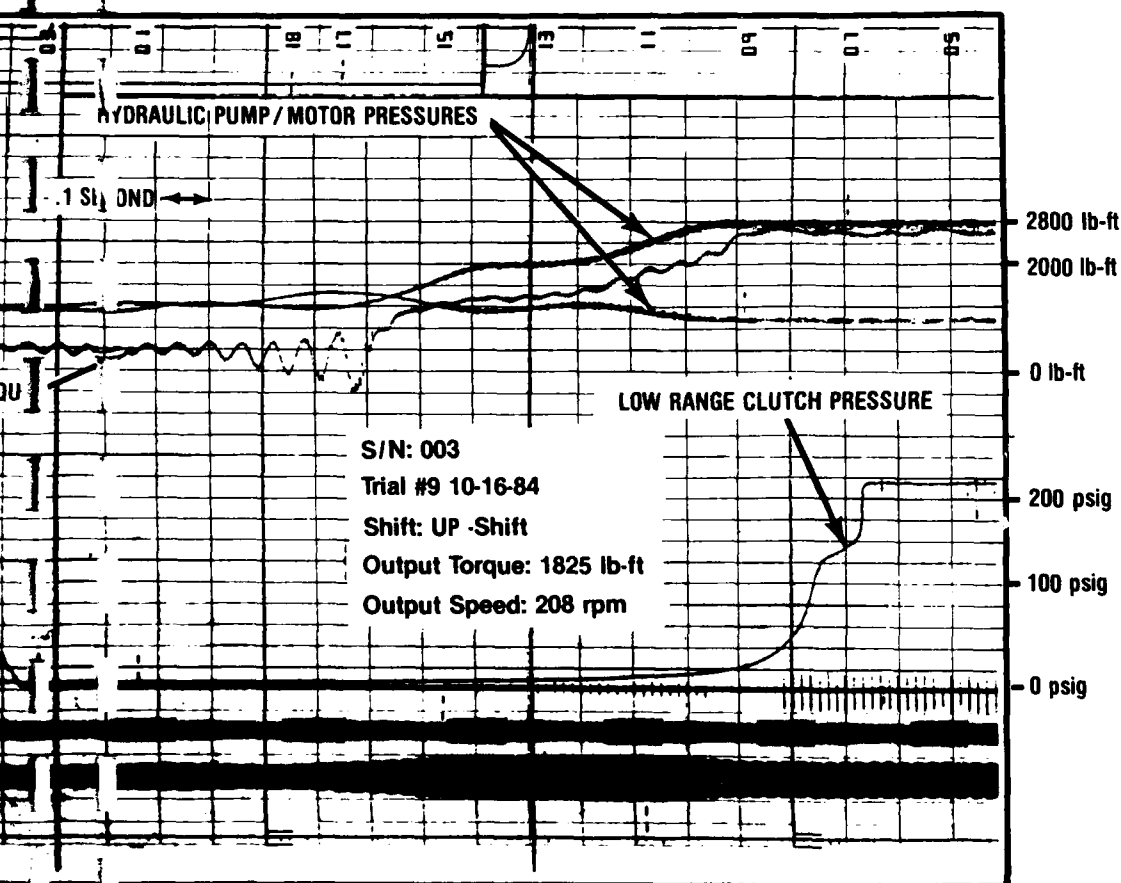
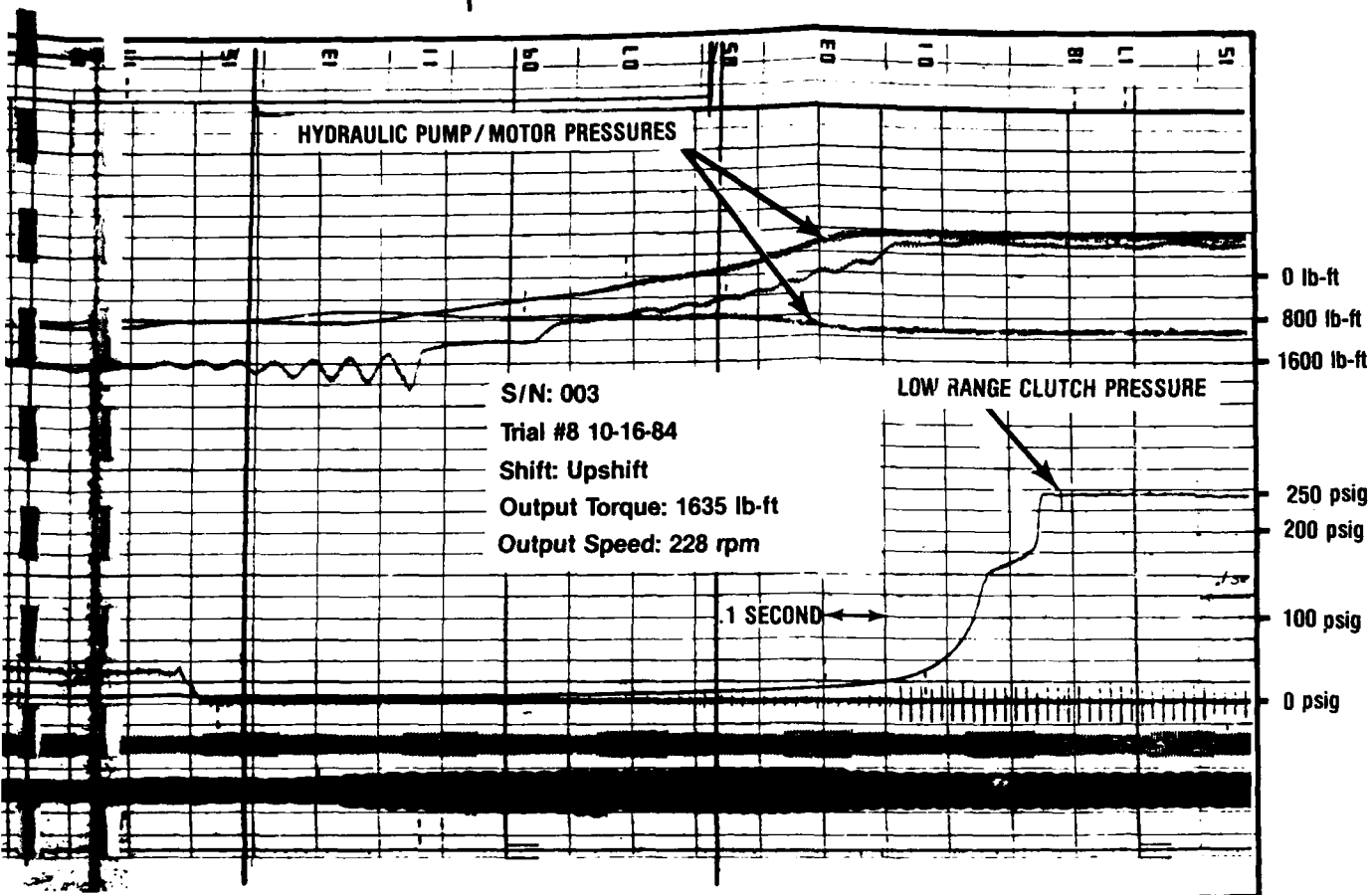
PTP10130REVA

6000 psig  
4000 psig  
2000 psig  
0 psig



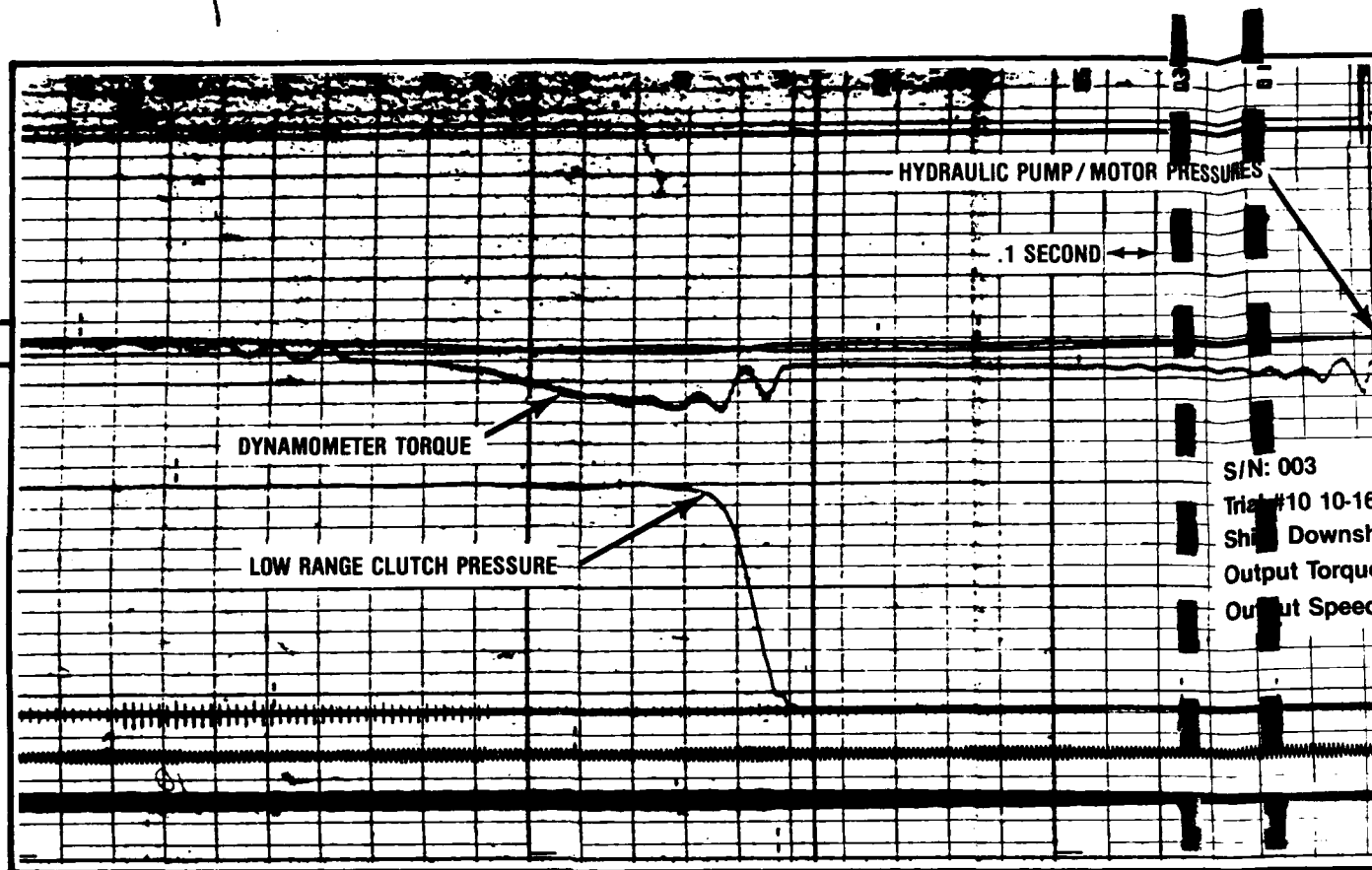
6000 psig  
4000 psig  
2000 psig  
0 psig



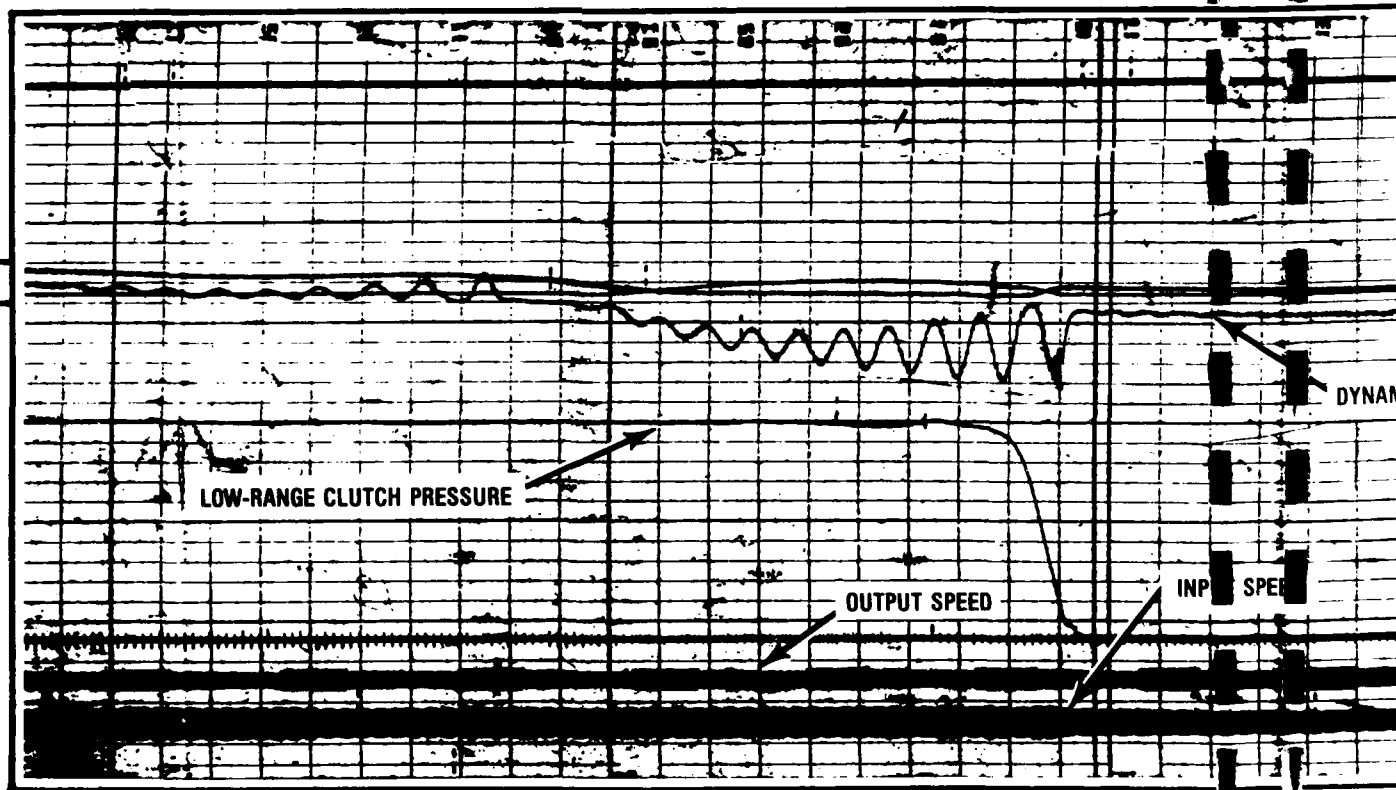


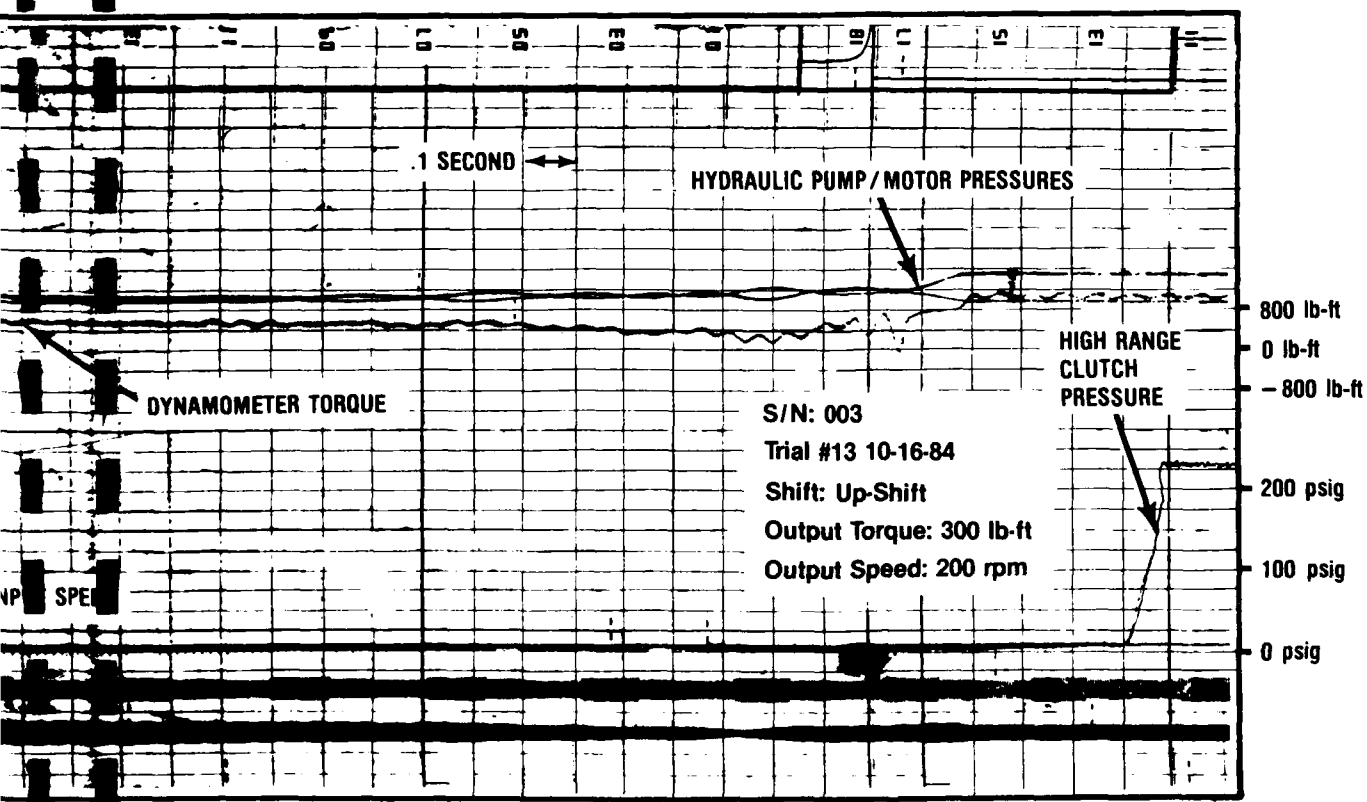
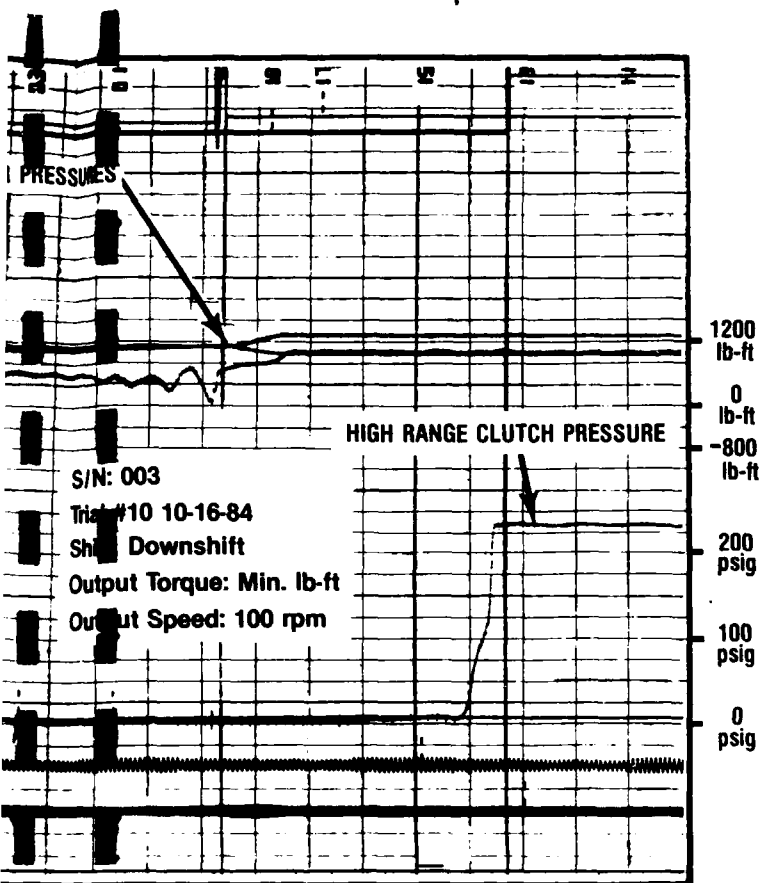


2000  
psig  
0  
psig



2000  
psig  
0  
psig





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Run No. 1

	09:31:36	09:35:04	09:40:03	09:45:04	09:50:00
FD Output Power (hp)	2	2	2	2	2
Output Torque(lb-ft)	232	219	215	209	210
FD Output Speed(rpm)	48	45	44	44	41
FD Input Speed (rpm)	507	475	466	459	457
Pump Speed (rpm)	2028	2089	2091	2090	2092
Pump P Pressure(psi)	485	490	480	480	477
Pump S Pressure(psi)	1546	1405	1340	1293	1271
Pump Control Volt(V)	4.9	4.9	4.9	4.9	4.9
Ambient (oF)	68	68	74	75	75
Temp into F.D. (oF)			175		
Temp inside F.D.(oF)			183		
Brake Lube Flow(gpm)	.68 to .78				

	09:55:06	10:00:04	10:05:02	10:10:00	10:15:03
FD Output Power (hp)	2	2	2	2	9
Output Torque(lb-ft)	211	207	205	209	232
FD Output Speed(rpm)	44	43	43	42	174
FD Input Speed (rpm)	456	447	446	445	776
Pump Speed (rpm)	2094	2093	2095	2098	2094
Pump P Pressure(psi)	476	478	478	475	473
Pump S Pressure(psi)	1234	1218	1201	1309	1550
Pump Control Volt(V)	4.9	4.9	4.9	4.9	6.2
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Brake Lube Flow(gpm)					.52

	10:20:00	10:25:04	10:30:04	10:35:04	10:40:00
FD Output Power (hp)	9	9	9	9	9
Output Torque(lb-ft)	278	273	269	270	265
FD Output Speed(rpm)	173	173	173	171	171
FD Input Speed (rpm)	769	771	770	762	765
Pump Speed (rpm)	2095	2097	2097	2084	2087
Pump P Pressure(psi)	470	467	468	464	460
Pump S Pressure(psi)	1468	1415	1402	1425	1382
Pump Control Volt(V)	6.2	6.2	6.2	6.2	6.2
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:45:00	10:50:05	10:55:06	11:00:01	11:05:05
FD Output Power (hp)	9	13	12	12	19
Output Torque(lb-ft)	267	299	303	299	339
FD Output Speed(rpm)	172	221	208	207	300
FD Input Speed (rpm)	766	990	988	986	1345
Pump Speed (rpm)	2088	2086	2086	2086	2083
Pump P Pressure(psi)	461	459	458	460	452
Pump S Pressure(psi)	1377	1632	1613	1618	1898
Pump Control Volt(V)	6.2	6.8	6.8	6.8	8.1
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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	11:10:04	11:15:03	11:20:05	11:25:01	11:30:02
FD Output Power (hp)	19	19	23	24	23
Output Torque(lb-ft)	333	332	349	349	345
FD Output Speed(rpm)	299	299	351	356	350
FD Input Speed (rpm)	1356	1341	1575	1567	1569
Pump Speed (rpm)	2061	2094	2082	2094	2086
Pump P Pressure(psi)	456	453	453	456	452
Pump S Pressure(psi)	1962	1601	2106	2090	2116
Pump Control Volt(V)	8.1	8.1	9.3	9.3	9.3
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	12:58:26	13:00:03	13:05:03	13:10:03	13:15:04
FD Output Power (hp)	7	5	1	4	6
Output Torque(lb-ft)	306	214	42	205	230
FD Output Speed(rpm)	114	121	119	114	136
FD Input Speed (rpm)	1192	1258	1245	1197	1424
Pump Speed (rpm)	2113	2114	2118	2118	2118
Pump P Pressure(psi)	469	468	462	459	462
Pump S Pressure(psi)	1056	955	898	866	913
Pump Control Volt(V)	7.2	7.2	7.2	7.1	8.1
Ambient (oF)	70	70	70	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:20:05	13:25:00	13:30:05	13:35:03	13:40:01
FD Output Power (hp)	12	3	4	17	31
Output Torque(lb-ft)	295	167	184	902	1659
FD Output Speed(rpm)	206	87	101	100	99
FD Input Speed (rpm)	2285	911	1056	1044	1038
Pump Speed (rpm)	2116	2122	2122	2116	2115
Pump P Pressure(psi)	464	459	463	462	455
Pump S Pressure(psi)	1313	716	863	1526	1843
Pump Control Volt(V)	11.0	6.1	6.5	6.5	6.5
Ambient (oF)	71	71	71	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	13:45:01	13:50:01	13:55:01	14:00:00	14:05:00
FD Output Power (hp)	32	31	31	32	31
Output Torque(lb-ft)	1674	1663	1645	1475	1448
FD Output Speed(rpm)	99	99	99	113	114
FD Input Speed (rpm)	1039	1040	1042	1198	1189
Pump Speed (rpm)	2118	2118	2122	2122	2123
Pump P Pressure(psi)	456	458	456	453	455
Pump S Pressure(psi)	1844	1843	1851	1762	1752
Pump Control Volt(V)	6.5	6.5	6.5	7.0	7.0
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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	14:10:02	14:15:03	14:20:00	14:25:04	14:30:02
FD Output Power (hp)	32	32	33	32	31
Output Torque(lb-ft)	1326	1321	1368	1351	1305
FD Output Speed(rpm)	126	126	126	126	125
FD Input Speed (rpm)	1320	1319	1317	1316	1317
Pump Speed (rpm)	2123	2121	2123	2122	2124
Pump P Pressure(psi)	457	457	460	454	453
Pump S Pressure(psi)	1724	1721	1738	1735	1690
Pump Control Volt(V)	7.5	7.5	7.5	7.5	7.5
Ambient (oF)	72	72	72	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:35:02	14:40:01	14:45:00	14:50:00	14:55:02
FD Output Power (hp)	34	32	32	32	1
Output Torque(lb-ft)	1321	1232	1261	1174	1094
FD Output Speed(rpm)	133	136	134	143	6
FD Input Speed (rpm)	1398	1422	1403	1495	1589
Pump Speed (rpm)	2124	2126	2127	2126	2128
Pump P Pressure(psi)	454	456	453	458	457
Pump S Pressure(psi)	1773	1708	1726	1724	1722
Pump Control Volt(V)	8.1	8.1	8.1	8.5	9.0
Ambient (oF)	71	71	71	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:00:01	15:05:03	15:10:00	15:15:00	15:20:05
FD Output Power (hp)	32	32	33	20	32
Output Torque(lb-ft)	1055	1015	959	865	853
FD Output Speed(rpm)	159	165	179	124	199
FD Input Speed (rpm)	1719	1722	1864	2038	2207
Pump Speed (rpm)	2132	2133	2134	2135	2136
Pump P Pressure(psi)	458	453	453	456	452
Pump S Pressure(psi)	1806	1769	1824	1840	1949
Pump Control Volt(V)	9.5	9.5	10.0	10.5	11.0
Ambient (oF)	70	70	71	70	70
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:25:04	15:30:00	15:35:02	15:40:04	15:45:00
FD Output Power (hp)	31	31	32	29	*33
Output Torque(lb-ft)	739	726	726	707	840
FD Output Speed(rpm)	220	226	232	218	*204
FD Input Speed (rpm)	2438	2429	2430	2408	2088
Pump Speed (rpm)	2137	2138	2139	2140	2140
Pump P Pressure(psi)	458	453	453	446	453
Pump S Pressure(psi)	1948	1916	1925	1973	1844
Pump Control Volt(V)	11.5	11.5	11.5	11.5	10.5
Ambient (oF)	70	70	70	70	70
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Date: 10:09:34

	15:50:05	15:55:05	16:00:05	16:05:05	16:10:00
FD Output Power (hp)	*30	-4	-5	-5	-5
Output Torque(lb-ft)	905	-194	-230	-211	-212
FD Output Speed(rpm)	*200	105	114	114	114
FD Input Speed (rpm)	2105	1103	1189	1193	1197
Pump Speed (rpm)	2140	2146	2151	2151	2151
Pump P Pressure(psi)	455	987	1002	1079	1037
Pump S Pressure(psi)	1801	371	374	370	371
Pump Control Volt(V)	10.5	7.3	7.6	7.6	7.6
Ambient (oF)	70	70	71	72	72
Temp into F.D. (oF)			173		
Temp inside F.D.(oF)			186		

	16:15:03	16:20:05	16:25:01	16:30:00	16:35:05
FD Output Power (hp)	-6	-6	-7	-0	-8
Output Torque(lb-ft)	-232	-230	-245	-252	-264
FD Output Speed(rpm)	132	130	143	*	164
FD Input Speed (rpm)	1381	1362	1496	1606	1736
Pump Speed (rpm)	2152	2153	2154	2153	2156
Pump P Pressure(psi)	1091	1092	1132	1172	1226
Pump S Pressure(psi)	370	375	371	371	371
Pump Control Volt(V)	9.0	8.0	8.5	9.0	9.5
Ambient (oF)	72	72	72	72	71
Temp into F.D. (oF)			171		
Temp inside F.D.(oF)			181		

	16:40:04	16:45:02	16:50:00	16:55:02	17:00:04
FD Output Power (hp)	-10	-10	-13	-18	-13
Output Torque(lb-ft)	-289	-285	-312	-333	-332
FD Output Speed(rpm)	*196	*196	224	285	*201
FD Input Speed (rpm)	2049	2038	2479	2983	2112
Pump Speed (rpm)	2154	2157	2154	2153	2157
Pump P Pressure(psi)	1412	1385	1654	1978	1316
Pump S Pressure(psi)	370	374	370	364	372
Pump Control Volt(V)	10.5	10.5	11.6	12.5	10.5
Ambient (oF)	71	72	71	71	71
Temp into F.D. (oF)			169		
Temp inside F.D.(oF)			203		

	17:05:06	17:10:01	17:15:01	17:20:00	17:25:01
FD Output Power (hp)	-8	-8	-8	-8	-8
Output Torque(lb-ft)	-249	-250	-251	-253	-258
FD Output Speed(rpm)	163	164	164	164	165
FD Input Speed (rpm)	1707	1718	1767	1722	1743
Pump Speed (rpm)	2159	2161	2159	2160	2160
Pump P Pressure(psi)	1178	1172	1189	1249	1178
Pump S Pressure(psi)	372	375	372	373	371
Pump Control Volt(V)	9.0	9.0	9.0	9.0	9.0
Ambient (oF)	72	71	71	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Output Speed Calculated

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Date: 10-09-84

Final Drive S/N 3

Run No. 1

	17:30:00	17:35:01	17:40:04	17:45:02	17:50:00
FD Output Power (hp)	0	-16	-15	-15	-15
Output Torque(lb-ft)	375	-320	-316	-318	-316
FD Output Speed(rpm)	0	254	254	256	252
FD Input Speed (rpm)	0	1140	1139	1146	1146
Pump Speed (rpm)	2162	2161	2162	2164	2167
Pump P Pressure(psi)	485	1818	1883	1750	1771
Pump S Pressure(psi)	393	372	370	369	370
Pump Control Volt(V)	0.0	7.5	7.5	7.5	7.5
Ambient (oF)	70	71	71	70	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	17:55:02	18:00:02	18:05:01	18:10:00	18:15:04
FD Output Power (hp)	-15	-15	-15	-20	-20
Output Torque(lb-ft)	-315	-312	-315	-341	-339
FD Output Speed(rpm)	256	257	256	309	307
FD Input Speed (rpm)	1149	1149	1148	1366	1375
Pump Speed (rpm)	2168	2166	2167	2166	2164
Pump P Pressure(psi)	1781	1766	1796	1963	2041
Pump S Pressure(psi)	371	374	374	368	373
Pump Control Volt(V)	7.5	7.5	7.5	8.1	8.1
Ambient (oF)	72	73	73	73	73
Temp into F.D. (oF)			187		
Temp inside F.D.(oF)			198		

	18:20:04	18:25:03	18:30:05	18:35:01	18:37:34
FD Output Power (hp)	-21	-21	-21	-21	0
Output Torque(lb-ft)	-339	-347	-342	-345	27
FD Output Speed(rpm)	319	319	320	321	0
FD Input Speed (rpm)	1429	1432	1436	1455	0
Pump Speed (rpm)	2164	2166	2164	2166	0
Pump P Pressure(psi)	2141	1988	1395	1929	-0
Pump S Pressure(psi)	365	372	369	370	-0
Pump Control Volt(V)	8.4	8.4	8.4	8.4	0.0
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)	174				
Temp inside F.D.(oF)	205				

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Final Drive S/N 3

Run No. 2

	06:28:36	06:30:04	06:35:00	06:40:01	06:45:02
FD Output Power (hp)	15	21	33	30	32
Output Torque(lb-ft)	299	341	532	501	532
FD Output Speed(rpm)	262	331	326	315	317
FD Input Speed (rpm)	1172	1484	1425	1406	1420
Pump Speed (rpm)	2095	2093	2093	2092	2091
Pump P Pressure(psi)	460	462	456	457	455
Pump S Pressure(psi)	1779	2085	2260	2118	2160
Pump Control Volt(V)	6.9	8.3	8.3	8.3	8.5
Ambient (oF)	72	78	75	72	71
Temp into F.D. (oF)				161	
Temp inside F.D. (oF)				168	

	06:50:01	06:55:05	07:00:01	07:05:04	07:10:02
FD Output Power (hp)	32	31	31	33	31
Output Torque(lb-ft)	526	523	489	484	455
FD Output Speed(rpm)	316	316	338	362	363
FD Input Speed (rpm)	1415	1415	1519	1619	1623
Pump Speed (rpm)	2093	2096	2098	2095	2095
Pump P Pressure(psi)	450	451	448	459	452
Pump S Pressure(psi)	2137	2110	1959	2084	2012
Pump Control Volt(V)	8.5	8.5	9.0	9.5	9.5
Ambient (oF)	74	78	75	74	73
Temp into F.D. (oF)		161	165	165	
Temp inside F.D. (oF)		172	168	169	

	07:15:00	07:20:04	07:25:05	07:30:00	07:48:57
FD Output Power (hp)	35	52	50	39	0
Output Torque(lb-ft)	467	538	518	400	-51
FD Output Speed(rpm)	392	509	505	509	0
FD Input Speed (rpm)	1757	2280	2258	2278	0
Pump Speed (rpm)	2096	2089	2088	2091	0
Pump P Pressure(psi)	452	443	442	443	-1
Pump S Pressure(psi)	2186	3261	3106	2747	-6
Pump Control Volt(V)	10.0	11.7	11.7	11.7	0.0
Ambient (oF)	72	71	75	73	70
Temp into F.D. (oF)	160	166		188	
Temp inside F.D. (oF)	163	178		190	



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	18:30:02	18:35:01	18:38:12	<del>13:07:13</del>	<del>13:10:04</del>
FD Output Power (hp)	62	62	0	<del>-93</del>	<del>34</del>
Output Torque(lb-ft)	694	701	60	<del>5021</del>	<del>-4379</del>
FD Output Speed(rpm)	466	466	0	<del>97</del>	<del>100</del>
FD Input Speed (rpm)	2080	2087	0	<del>1010</del>	<del>1043</del>
Pump Speed (rpm)	2133	2133	106	<del>2126</del>	<del>2129</del>
Pump P Pressure(psi)	446	434	-0	<del>5536</del>	<del>5422</del>
Pump S Pressure(psi)	3322	3325	-0	<del>372</del>	<del>369</del>
Pump Control Volt(V)	2.2	2.5	0.4	<del>7.2</del>	<del>7.2</del>
Ambient (oF)	74	73	73	<del>71</del>	<del>72</del>
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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Run No. 3

	16:52:03	16:55:00	17:00:01	17:05:04	17:10:00
FD Output Power (hp)	31	30	29	31	35
Output Torque(lb-ft)	413	398	395	402	460
FD Output Speed(rpm)	397	397	402	400	354
FD Input Speed (rpm)	1775	1809	1800	1790	1766
Pump Speed (rpm)	2122	2123	2135	2135	2133
Pump P Pressure(psi)	452	454	453	460	454
Pump S Pressure(psi)	2109	2042	2006	2045	2155
Pump Control Volt(V)	1.0	1.6	2.1	1.2	1.0
Ambient (oF)	70	71	71	72	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					
Control Flow (gpm)				3.5	
Brake Lub Flow (gpm)				.89	
	17:15:02	17:20:05	17:25:02	17:30:05	17:35:03
FD Output Power (hp)	34	35	35	34	33
Output Torque(lb-ft)	451	407	405	404	388
FD Output Speed(rpm)	397	456	448	446	448
FD Input Speed (rpm)	1792	2013	2000	2008	2017
Pump Speed (rpm)	2136	2134	2136	2134	2137
Pump P Pressure(psi)	453	449	455	450	455
Pump S Pressure(psi)	2117	2250	2248	2244	2235
Pump Control Volt(V)	0.9	1.4	1.6	1.3	1.1
Ambient (oF)	72	72	73	72	72
Temp into F.D. (oF)	170				
Temp inside F.D.(oF)	175				
Control Flow (gpm)	3.5				
Brake Lube Flow (gpm)	.90				
	17:40:00	17:45:03	17:50:02	17:55:01	18:00:01
FD Output Power (hp)	33	33	61	61	62
Output Torque(lb-ft)	371	387	756	785	800
FD Output Speed(rpm)	462	449	423	410	407
FD Input Speed (rpm)	2001	2042	1858	1837	1824
Pump Speed (rpm)	2137	2136	2132	2132	2132
Pump P Pressure(psi)	454	446	445	447	451
Pump S Pressure(psi)	2226	2234	3106	3126	3133
Pump Control Volt(V)	1.7	0.8	1.4	1.5	1.7
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)		179			
Temp inside F.D.(oF)		185			
Control Flow (gpm)		3.6			
	18:05:03	18:10:00	18:15:01	18:20:05	18:25:02
FD Output Power (hp)	62	61	63	61	59
Output Torque(lb-ft)	800	788	708	681	667
FD Output Speed(rpm)	407	406	465	467	467
FD Input Speed (rpm)	1823	1823	2075	2090	2115
Pump Speed (rpm)	2133	2133	2131	2132	2133
Pump P Pressure(psi)	448	451	443	433	445
Pump S Pressure(psi)	3137	3111	3376	3268	3274
Pump Control Volt(V)	2.0	1.7	1.7	2.4	2.4
Ambient (oF)	73	73	73	74	74
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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	06:19:15	06:20:02	06:25:03	06:30:02	06:35:02
FD Output Power (hp)	62	66	66	65	64
Output Torque(lb-ft)	933	927	1042	743	805
FD Output Speed(rpm)	351	375	332	456	419
FD Input Speed (rpm)	1573	1569	1485	1936	1977
Pump Speed (rpm)	2156	2160	2158	2161	2163
Pump P Pressure(psi)	465	458	459	445	447
Pump S Pressure(psi)	3473	3358	3564	3495	3542
Pump Control Volt(V)	1.3	1.1	1.3	1.2	1.3
Ambient (oF)	79	79	80	80	31
Temp into F.D. (oF)	133		160		176
Temp inside F.D.(oF)	141		168		186
Brake Lube Flow (gpm)			.86		.95
Control Flow (gpm)			3.3		3.6
	06:40:00	06:45:03	06:50:04	06:55:00	07:00:02
FD Output Power (hp)	61	57	61	67	61
Output Torque(lb-ft)	614	584	618	647	750
FD Output Speed(rpm)	520	511	514	540	425
FD Input Speed (rpm)	2326	2289	2308	2321	1901
Pump Speed (rpm)	2156	2156	2160	2159	2164
Pump P Pressure(psi)	451	426	439	436	449
Pump S Pressure(psi)	3985	3961	3773	3656	3308
Pump Control Volt(V)	1.6	1.5	1.4	1.7	1.3
Ambient (oF)	32	61	77	75	74
Temp into F.D. (oF)	168			167	165
Temp inside F.D.(oF)	190			191	177
	07:05:05	07:10:00	07:15:01	07:20:04	07:25:01
FD Output Power (hp)	64	68	65	63	64
Output Torque(lb-ft)	797	847	806	782	796
FD Output Speed(rpm)	423	421	425	425	424
FD Input Speed (rpm)	1895	1888	1902	1919	1900
Pump Speed (rpm)	2162	2160	2162	2163	2160
Pump P Pressure(psi)	440	439	445	445	434
Pump S Pressure(psi)	3430	3591	3489	3426	3460
Pump Control Volt(V)	1.7	2.3	10.6	10.6	10.6
Ambient (oF)	77	81	80	76	74
Temp into F.D. (oF)		167			174
Temp inside F.D.(oF)		178			184
Brake Lube Flow (gpm)		.88			
Control Flow (gpm)		3.4			
	07:30:01	07:35:00	07:40:04	07:45:04	07:50:03
FD Output Power (hp)	64	64	64	62	65
Output Torque(lb-ft)	797	788	788	770	768
FD Output Speed(rpm)	425	425	425	424	444
FD Input Speed (rpm)	1906	1905	1902	1901	1904
Pump Speed (rpm)	2159	2161	2158	2160	2160
Pump P Pressure(psi)	428	445	450	433	443
Pump S Pressure(psi)	3459	3458	3419	3373	3363
Pump Control Volt(V)	10.6	10.6	10.6	10.6	10.6
Ambient (oF)	74	80	81	76	74
Temp into F.D. (oF)					165
Temp inside F.D.(oF)					173

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	07:55:01	08:00:01	08:05:03	08:46:03	08:50:01
FD Output Power (hp)	64	68	-1	-36	-31
Output Torque(lb-ft)	800	538	-107	-1439	-1222
FD Output Speed(rpm)	421	662	32	133	133
FD Input Speed (rpm)	1898	2370	0	1390	1395
Pump Speed (rpm)	579	2148	2186	2049	2055
Pump P Pressure(psi)	436	372	476	2341	2084
Pump S Pressure(psi)	3146	5693	387	378	378
Pump Control Volt(V)	10.6	19.6	-0.0	8.1	8.1
Ambient (oF)	73	73	79	61	61
Temp into F.D. (oF)	167	174	174		
Temp inside F.D. (oF)	177	225	230		

.6 to 1.8

	08:55:04	09:00:01	09:05:02	09:10:04	09:15:00
FD Output Power (hp)	-32	-32	-31	-31	-31
Output Torque(lb-ft)	-1273	-1266	-1247	-1238	-1242
FD Output Speed(rpm)	132	132	132	132	132
FD Input Speed (rpm)	1381	1381	1383	1385	1386
Pump Speed (rpm)	2060	2065	2067	2072	2076
Pump P Pressure(psi)	2108	2073	2048	2031	2036
Pump S Pressure(psi)	371	368	368	370	367
Pump Control Volt(V)	8.1	8.1	8.1	8.1	8.1
Ambient (oF)	72	77	78	74	73
Temp into F.D. (oF)	133				
Temp inside F.D. (oF)	159				

	09:20:03	09:25:05	09:30:00	09:35:01	09:40:00
FD Output Power (hp)	-31	-36	-32	-31	-31
Output Torque(lb-ft)	-1215	-1343	-1176	-1156	-1155
FD Output Speed(rpm)	132	142	143	143	143
FD Input Speed (rpm)	1395	1491	1500	1498	1497
Pump Speed (rpm)	2075	2073	2074	2071	2072
Pump P Pressure(psi)	2000	2224	2067	2054	2050
Pump S Pressure(psi)	370	369	369	366	367
Pump Control Volt(V)	8.1	8.8	8.8	8.8	8.8
Ambient (oF)	72	72	72	72	71
Temp into F.D. (oF)		179			
Temp inside F.D. (oF)		185			

	09:45:01	09:50:00	09:55:03	10:00:05	10:05:00
FD Output Power (hp)	-32	-34	-33	-33	-34
Output Torque(lb-ft)	-1157	-946	-939	-940	-950
FD Output Speed(rpm)	143	187	186	186	186
FD Input Speed (rpm)	1499	1956	1948	1944	1947
Pump Speed (rpm)	2073	2074	2073	2075	2077
Pump P Pressure(psi)	2057	2234	2209	2202	2201
Pump S Pressure(psi)	367	366	367	366	367
Pump Control Volt(V)	8.8	10.4	10.4	10.4	10.4
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)	157		168		186
Temp inside F.D. (oF)	179		188		198

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Run No. 4

	10:10:01	10:15:01	10:20:00	10:25:02	10:30:02
FD Output Power (hp)	-33	-32	-32	-33	-33
Output Torque(lb-ft)	-810	-797	-784	-635	-628
FD Output Speed(rpm)	213	212	212	277	278
FD Input Speed (rpm)	2227	2221	2222	1239	1243
Pump Speed (rpm)	2078	2073	2076	2073	2074
Pump P Pressure(psi)	2207	2186	2141	2528	2520
Pump S Pressure(psi)	366	363	367	362	362
Pump Control Volt(V)	11.1	11.1	11.1	7.6	7.6
Ambient (oF)	72	72	72	72	72
Temp into F.D. (oF)			165		
Temp inside F.D.(oF)			195		

	10:35:02	10:40:04	10:45:02	10:50:03	10:55:05
FD Output Power (hp)	0	-36	-36	-34	-34
Output Torque(lb-ft)	-67	-660	-665	-629	-633
FD Output Speed(rpm)	0	285	284	285	284
FD Input Speed (rpm)	0	1279	1274	1275	1273
Pump Speed (rpm)	2085	2071	2071	2072	2073
Pump P Pressure(psi)	484	2627	2642	2552	2545
Pump S Pressure(psi)	392	367	365	366	366
Pump Control Volt(V)	-0.0	7.8	7.8	7.8	7.8
Ambient (oF)	72	72	73	73	73
Temp into F.D. (oF)		165	178		
Temp inside F.D.(oF)		197	201		

	11:00:02	11:05:05	11:10:04	11:15:04	11:20:03
FD Output Power (hp)	-35	-32	-32	-32	-32
Output Torque(lb-ft)	-641	-522	-517	-512	-516
FD Output Speed(rpm)	284	326	326	325	326
FD Input Speed (rpm)	1273	1462	1460	1458	1464
Pump Speed (rpm)	2075	2075	2072	2073	2076
Pump P Pressure(psi)	2563	2557	2539	2544	2524
Pump S Pressure(psi)	366	368	366	366	367
Pump Control Volt(V)	7.8	8.7	8.7	8.7	8.7
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	11:25:00	11:30:01	11:33:24	07:45:04	07:50:07
FD Output Power (hp)	-32	-32	0	62	65
Output Torque(lb-ft)	-517	-511	-61	770	768
FD Output Speed(rpm)	327	327	0	424	444
FD Input Speed (rpm)	1463	1465	0	1901	1904
Pump Speed (rpm)	2077	2077	0	2160	2160
Pump P Pressure(psi)	2537	2528	-0	433	443
Pump S Pressure(psi)	365	365	0	3373	3363
Pump Control Volt(V)	8.7	8.7	0.0	10.6	10.6
Ambient (oF)	72	73	73	76	74
Temp into F.D. (oF)	182				
Temp inside F.D.(oF)	209				

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Final Drive S/N 3

Run No. 5

	07:27:41	07:30:00	07:35:00	07:40:02	07:45:04
FD Output Power (hp)	-70	-61	-64	-62	-65
Output Torque(lb-ft)	-1354	-1182	-1278	-1246	-1130
FD Output Speed(rpm)	273	271	263	260	300
FD Input Speed (rpm)	1222	1216	1180	1164	1346
Pump Speed (rpm)	2036	2041	2042	2041	2040
Pump P Pressure(psi)	4316	3757	3855	3719	3828
Pump S Pressure(psi)	377	373	372	367	359
Pump Control Volt(V)	7.4	7.4	7.4	7.4	8.4
Control Oil Flow(gpm)	2.70	2.92	2.94	2.95	3.04
Brake Lube Flow(gpm)	0.51	0.59	0.66	0.66	0.72
Ambient (oF)	84	85	85	84	84
Temp into F.D. (oF)		160	164		
Temp inside F.D.(oF)		164	171		

	07:50:04	07:55:04	08:00:02	08:05:02	08:10:03
FD Output Power (hp)	-62	-61	-62	-60	-62
Output Torque(lb-ft)	-1088	-1066	-1100	-901	-920
FD Output Speed(rpm)	300	298	297	352	351
FD Input Speed (rpm)	1344	1337	1332	1576	1572
Pump Speed (rpm)	2041	2043	2041	2045	2047
Pump P Pressure(psi)	3717	3759	3822	3930	3968
Pump S Pressure(psi)	362	367	363	353	362
Pump Control Volt(V)	8.4	8.4	8.4	9.6	9.6
Control Oil Flow(gpm)	3.00	3.02	2.95	3.12	3.10
Brake Lube Flow(gpm)	0.69	0.69	0.64	0.75	0.74
Ambient (oF)	85	84	81	79	79
Temp into F.D. (oF)	166		164		173
Temp inside F.D.(oF)	185		187		205

	08:15:00	08:20:03	08:25:03	08:30:02	08:35:03
FD Output Power (hp)	-66	-63	-62	-62	-60
Output Torque(lb-ft)	-909	-870	-865	-861	-837
FD Output Speed(rpm)	379	379	379	378	379
FD Input Speed (rpm)	1696	1700	1697	1693	1698
Pump Speed (rpm)	2045	2048	2048	2047	2047
Pump P Pressure(psi)	4285	4137	4124	4111	4058
Pump S Pressure(psi)	356	361	358	358	360
Pump Control Volt(V)	10.1	10.1	10.1	10.1	10.1
Control Oil Flow(gpm)	3.05	3.10	3.19	3.08	3.00
Brake Lube Flow(gpm)	0.71	0.73	0.79	0.72	0.67
Ambient (oF)	79	80	79	79	79
Temp into F.D. (oF)		174		171	
Temp inside F.D.(oF)		205		210	

	08:40:02	08:45:03	08:50:03	08:55:06	09:00:02
FD Output Power (hp)	-61	-65	-64	-64	-61
Output Torque(lb-ft)	-845	-1083	-1061	-1069	-1013
FD Output Speed(rpm)	380	315	316	317	318
FD Input Speed (rpm)	1700	1411	1416	1418	1426
Pump Speed (rpm)	2047	2047	2048	2052	2053
Pump P Pressure(psi)	4053	3950	3911	3944	3818
Pump S Pressure(psi)	361	361	361	359	361
Pump Control Volt(V)	10.1	8.7	8.7	8.7	8.7
Control Oil Flow(gpm)	3.08	3.00	2.97	3.03	3.09
Brake Lube Flow(gpm)	0.71	0.66	0.64	0.69	0.71
Ambient (oF)	79	79	79	79	79
Temp into F.D. (oF)	171		165		167
Temp inside F.D.(oF)	206	4-65	191		193

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	09:05:02	09:10:00	09:15:03	09:20:00	09:25:02
FD Output Power (hp)	-62	-61	-61	-61	-63
Output Torque(lb-ft)	-1016	-1011	-1003	-1006	-579
FD Output Speed(rpm)	319	319	320	320	573
FD Input Speed (rpm)	1428	1431	1432	1434	2567
Pump Speed (rpm)	2053	2055	2057	2057	2048
Pump P Pressure(psi)	3814	3821	3812	3801	5574
Pump S Pressure(psi)	360	363	360	362	342
Pump Control Volt(V)	8.7	3.7	8.7	8.7	12.4
Control Oil Flow(gpm)	3.05	3.18	3.03	3.01	3.02
Brake Lube Flow(gpm)	0.70	0.77	0.66	0.66	0.68
Ambient (oF)	80	80	80	80	80
Temp into F.D. (oF)		176		166	167
Temp inside F.D.(oF)		200		193	240

	09:30:01	09:35:00	09:40:04	09:45:02	09:50:01
FD Output Power (hp)	-62	-56	-63	-64	-61
Output Torque(lb-ft)	-574	-1055	-1205	-1206	-1152
FD Output Speed(rpm)	563	277	276	278	279
FD Input Speed (rpm)	2520	1238	1237	1244	1252
Pump Speed (rpm)	2049	2059	2057	2058	2055
Pump P Pressure(psi)	5503	3344	3744	3762	3671
Pump S Pressure(psi)	346	357	362	366	364
Pump Control Volt(V)	12.4	7.4	7.4	7.4	7.4
Control Oil Flow(gpm)	3.09	3.08	2.96	3.06	3.08
Brake Lube Flow(gpm)	0.73	0.71	0.63	0.69	0.71
Ambient (oF)	80	80	80	79	80
Temp into F.D. (oF)	171	168	163		168
Temp inside F.D.(oF)	242	196	188		190

	09:55:01	10:00:00	10:05:03	10:10:00	10:15:04
FD Output Power (hp)	-60	-60	-94	-93	-92
Output Torque(lb-ft)	-1131	-1130	-1867	-1856	-1853
FD Output Speed(rpm)	281	281	264	262	260
FD Input Speed (rpm)	1257	1258	1184	1174	1165
Pump Speed (rpm)	2058	2058	2047	2051	2053
Pump P Pressure(psi)	3634	3647	5155	5072	5006
Pump S Pressure(psi)	361	360	353	354	357
Pump Control Volt(V)	7.4	7.4	7.4	7.4	7.4
Control Oil Flow(gpm)	3.10	3.11	3.02	3.06	3.08
Brake Lube Flow(gpm)	0.71	0.72	0.66	0.69	0.70
Ambient (oF)	80	80	80	80	80
Temp into F.D. (oF)		170			
Temp inside F.D.(oF)		191			

	10:20:04	10:25:03	10:30:01	10:35:00	10:40:03
FD Output Power (hp)	-91	-2	0	0	0
Output Torque(lb-ft)	-1853	-711	14	15	-28
FD Output Speed(rpm)	259	11	0	0	0
FD Input Speed (rpm)	1160	48	0	0	0
Pump Speed (rpm)	2052	1217	0	0	0
Pump P Pressure(psi)	4991	436	-2	-7	-3
Pump S Pressure(psi)	350	376	-9	-8	-7
Pump Control Volt(V)	7.4	2.5	-0.0	-0.0	-0.0
Control Oil Flow(gpm)	3.08	3.08	3.02	3.00	0.00
Brake Lube Flow(gpm)	0.70	0.70	0.67	0.65	0.00
Ambient (oF)	81	80	79	80	81
Temp into F.D. (oF)	169				
Temp inside F.D.(oF)	189				

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Final Drive S/N 3

Run No. 6

	15:44:48	15:45:06	15:50:04	15:55:00	16:00:03
FD Output Power (hp)	-71	-79	-92	-89	-87
Output Torque(lb-ft)	-853	-931	-1013	-1019	-1023
FD Output Speed(rpm)	435	443	478	456	449
FD Input Speed (rpm)	1949	2002	2131	2045	2011
Pump Speed (rpm)	2055	2055	2050	2055	2054
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	237	236	237	237	235
Pump P Pressure(psi)	5227	5312	6153	5809	5751
Pump S Pressure(psi)	360	357	344	342	344
Pump Control Volt(V)	10.7	10.9	11.7	11.7	11.7
Control Oil Flow(gpm)	3.17	3.16	3.20	3.17	3.12
Brake Lube Flow(gpm)	0.72	0.72	0.74	0.72	0.70
Ambient (oF)	73	73	74	74	74
Temp into F.D. (oF)			173	169	167
Temp inside F.D.(oF)			207	197	201

	16:05:00	16:10:00	16:15:00	16:20:04	16:25:02
FD Output Power (hp)	-96	-96	-94	-33	-31
Output Torque(lb-ft)	-2295	-2278	-2211	-665	-672
FD Output Speed(rpm)	221	222	224	257	265
FD Input Speed (rpm)	987	992	1005	1152	1195
Pump Speed (rpm)	2060	2059	2060	2075	2076
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	234	233	232	236	236
Pump P Pressure(psi)	5579	5556	5439	2462	2521
Pump S Pressure(psi)	344	351	349	359	366
Pump Control Volt(V)	7.3	7.3	7.3	7.3	7.3
Control Oil Flow(gpm)	3.05	3.04	3.10	3.18	3.16
Brake Lube Flow(gpm)	0.65	0.65	0.69	0.73	0.72
Ambient (oF)	74	73	74	74	74
Temp into F.D. (oF)	161		171		
Temp inside F.D.(oF)	185		185		

	16:30:01	16:35:01	16:40:01	16:45:03	16:50:05
FD Output Power (hp)	-34	-34	-34	-32	-31
Output Torque(lb-ft)	-657	-664	-647	-547	-538
FD Output Speed(rpm)	268	271	272	304	305
FD Input Speed (rpm)	1202	1213	1219	1365	1366
Pump Speed (rpm)	2078	2079	2078	2077	2076
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	236	236	237	236	236
Pump P Pressure(psi)	2531	2552	2521	2505	2473
Pump S Pressure(psi)	361	369	365	368	368
Pump Control Volt(V)	7.3	7.3	7.3	8.0	8.0
Control Oil Flow(gpm)	3.16	3.16	3.16	3.17	3.18
Brake Lube Flow(gpm)	0.72	0.72	0.72	0.72	0.73
Ambient (oF)	74	73	73	73	73
Temp into F.D. (oF)	171				
Temp inside F.D.(oF)	186				



Date: 10/15/84

	16:55:01	17:00:05	17:05:02	17:10:04	17:15:01
FD Output Power (hp)	-31	-31	-38	-34	-34
Output Torque(lb-ft)	-540	-475	-439	-415	-413
FD Output Speed(rpm)	306	344	460	433	431
FD Input Speed (rpm)	1368	1537	2051	1932	1942
Pump Speed (rpm)	2081	2079	2077	2078	2079
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	237	236	238	239	237
Pump P Pressure(psi)	2457	2576	3199	2922	2894
Pump S Pressure(psi)	366	368	367	364	360
Pump Control Volt(V)	8.0	9.0	10.8	10.4	10.4
Control Oil Flow(gpm)	3.20	3.15	3.26	3.32	3.15
Brake Lube Flow(gpm)	0.74	0.72	0.77	0.81	0.71
Ambient (oF)	74	73	73	74	74
Temp into F.D. (oF)	174	171	176		172
Temp inside F.D.(oF)	191	191	197		205

	17:20:00	17:27:44	18:05:03	08:46:03	09:50:01
FD Output Power (hp)	0	0	-1	-36	31
Output Torque(lb-ft)	-38	-35	107	-1439	-1222
FD Output Speed(rpm)	0	0	32	133	133
FD Input Speed (rpm)	0	0	0	1390	1395
Pump Speed (rpm)	0	0	2186	2049	2055
Lo Rnge Clutch (psi)	8	8	3	-11	-15
Hi Rnge Clutch (psi)	232	227	4	5	10
Pump P Pressure(psi)	20	-3	476	3541	2084
Pump S Pressure(psi)	10	-9	387	378	378
Pump Control Volt(V)	-0.0	-0.0	-0.0	8.1	8.1
Control Oil Flow(gpm)	2.94	2.84	1.38	0.70	1.33
Brake Lube Flow(gpm)	0.59	0.54	1.04	0.70	0.90
Ambient (oF)	74	73	72	61	61
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

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 Date: 10:17:84  
 Final Drive S/N 3  
 Run No. 7

	12:34:15	12:35:05	12:40:05	12:45:01	12:50:04
FD Output Power (hp)	-91	-91	-95	-94	-93
Output Torque(lb-ft)	-4048	-4109	-4465	-4500	-4412
FD Output Speed(rpm)	118	116	111	110	110
FD Input Speed (rpm)	1231	1216	1163	1156	1155
Pump Speed (rpm)	1730	1731	1729	1728	1731
Lo Rnge Clutch (psi)	242	243	251	252	257
Hi Rnge Clutch (psi)	3	4	3	3	3
Pump P Pressure(psi)	5702	5763	5947	5990	5768
Pump S Pressure(psi)	372	368	364	356	358
Pump Control Volt(V)	9.2	9.2	9.2	9.5	9.5
Control Oil Flow(gpm)	0.00	0.11	0.49	0.49	0.52
Brake Lube Flow(gpm)	0.25	0.32	0.44	0.43	0.45
Ambient (oF)	68	69	77	75	72
Temp into F.D. (oF)	134		147		150
Temp inside F.D.(oF)	161		183		203

	12:55:03	14:03:47	14:05:01	14:10:04	14:15:01
FD Output Power (hp)	0	-118	-118	-124	-124
Output Torque(lb-ft)	6	-4978	-4951	-5123	-5379
FD Output Speed(rpm)	0	125	126	127	121
FD Input Speed (rpm)	0	1305	1316	1335	1274
Pump Speed (rpm)	1756	1933	1963	2091	2092
Lo Rnge Clutch (psi)	246	241	241	241	241
Hi Rnge Clutch (psi)	3	8	8	8	8
Pump P Pressure(psi)	453	6614	6444	6433	6531
Pump S Pressure(psi)	374	362	362	354	349
Pump Control Volt(V)	-0.0	8.8	8.8	8.8	8.8
Control Oil Flow(gpm)	0.51	0.93	0.93	0.92	0.93
Brake Lube Flow(gpm)	0.46	0.54	0.54	0.54	0.55
Ambient (oF)	71	70	70	70	70
Temp into F.D. (oF)				165	
Temp inside F.D.(oF)				195	

	14:20:04	14:25:02	14:30:02	14:35:01	14:40:01
FD Output Power (hp)	-123	-118	-124	-124	-124
Output Torque(lb-ft)	-5410	-2478	-2742	-2622	-2607
FD Output Speed(rpm)	120	251	237	248	251
FD Input Speed (rpm)	1251	1120	1061	1111	1123
Pump Speed (rpm)	2093	2091	2095	2161	2166
Lo Rnge Clutch (psi)	241	7	7	7	7
Hi Rnge Clutch (psi)	8	235	233	232	233
Pump P Pressure(psi)	6328	6762	6858	6583	6614
Pump S Pressure(psi)	345	346	341	337	341
Pump Control Volt(V)	8.8	8.1	8.1	8.1	8.1
Control Oil Flow(gpm)	0.95	3.10	3.10	3.15	3.16
Brake Lube Flow(gpm)	0.55	0.60	0.60	0.63	0.63
Ambient (oF)	70	71	70	70	70
Temp into F.D. (oF)				175	171
Temp inside F.D.(oF)				202	201

Date: 10:17:84

	14:47:15	14:50:01	14:55:01	15:00:01	15:05:03
FD Output Power (hp)	89	92	92	92	84
Output Torque(lb-ft)	3770	3910	3864	3902	2743
FD Output Speed(rpm)	123	123	124	124	162
FD Input Speed (rpm)	1294	1292	1301	1303	1692
Pump Speed (rpm)	2182	2183	2184	2186	2186
Lo Rnge Clutch (psi)	247	248	246	245	245
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	441	442	435	439	437
Pump S Pressure(psi)	3664	3791	3810	3814	3493
Pump Control Volt(V)	8.2	8.2	8.2	8.2	9.2
Control Oil Flow(gpm)	0.93	0.87	0.89	0.92	0.95
Brake Lube Flow(gpm)	0.49	0.46	0.46	0.49	0.51
Ambient (oF)	71	70	71	71	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:10:03	15:15:03	15:20:04	15:25:04	15:30:00
FD Output Power (hp)	100	94	95	94	94
Output Torque(lb-ft)	3358	3129	2591	2590	2587
FD Output Speed(rpm)	156	157	192	191	191
FD Input Speed (rpm)	1632	1641	2011	2003	2004
Pump Speed (rpm)	2183	2185	2187	2189	2189
Lo Rnge Clutch (psi)	244	244	244	245	244
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	433	436	435	434	435
Pump S Pressure(psi)	4134	3932	4039	3999	3979
Pump Control Volt(V)	9.9	9.9	11.1	11.1	11.1
Control Oil Flow(gpm)	0.98	1.00	1.02	1.04	1.02
Brake Lube Flow(gpm)	0.53	0.55	0.56	0.57	0.58
Ambient (oF)	71	71	71	71	72
Temp into F.D. (oF)	162	166		170	
Temp inside F.D.(oF)	195	201		205	

	15:35:04	15:40:01	15:45:02	15:48:41	09:15:00
FD Output Power (hp)	93	95	49	0	-31
Output Torque(lb-ft)	2552	2606	1327	-0	-1242
FD Output Speed(rpm)	191	191	194	0	132
FD Input Speed (rpm)	1999	2000	2008	0	1386
Pump Speed (rpm)	2210	2191	2205	83	2076
Lo Rnge Clutch (psi)	244	242	243	-0	-11
Hi Rnge Clutch (psi)	8	8	8	-0	11
Pump P Pressure(psi)	405	430	447	-0	2036
Pump S Pressure(psi)	4032	3971	1895	-0	367
Pump Control Volt(V)	11.1	11.1	9.8	0.0	8.1
Control Oil Flow(gpm)	1.04	1.03	1.05	0.00	1.67
Brake Lube Flow(gpm)	0.59	0.59	0.60	0.00	0.94
Ambient (oF)	72	72	71	71	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr  
 Date: 18:18:84  
 Final Drive S/N 3  
 Run No. 8

	06:35:28	06:40:01	06:45:02	06:50:02	06:55:05
FD Output Power (hp)	93	89	90	91	91
Output Torque(lb-ft)	2013	2021	2345	2613	1462
FD Output Speed(rpm)	242	232	201	184	326
FD Input Speed (rpm)	1083	1040	901	825	1463
Pump Speed (rpm)	2092	2090	2092	2090	2086
Lo Rnge Clutch (psi)	9	8	8	8	7
Hi Rnge Clutch (psi)	227	223	227	202	222
Pump P Pressure(psi)	454	434	431	427	417
Pump S Pressure(psi)	4667	4260	4483	4912	4392
Pump Control Volt(V)	7.1	7.1	7.1	7.1	10.4
Control Oil Flow(gpm)	2.79	2.67	2.74	2.62	2.87
Brake Lube Flow(gpm)	0.49	0.43	0.45	0.44	0.54
Ambient (oF)	71	76	79	75	73
Temp into F.D. (oF)	160		153		167
Temp inside F.D. (oF)	174		173		197

	07:00:04	07:05:04	07:24:45	07:25:04	07:30:03
FD Output Power (hp)	89	0	125	131	128
Output Torque(lb-ft)	1469	58	2541	2654	2551
FD Output Speed(rpm)	317	0	259	259	263
FD Input Speed (rpm)	1420	0	1159	1158	1178
Pump Speed (rpm)	2089	332	2181	2181	2185
Lo Rnge Clutch (psi)	7	7	10	10	10
Hi Rnge Clutch (psi)	239	241	246	245	239
Pump P Pressure(psi)	410	233	439	434	429
Pump S Pressure(psi)	4372	194	5426	5452	5250
Pump Control Volt(V)	10.4	-0.0	8.0	8.0	8.0
Control Oil Flow(gpm)	3.11	3.16	3.44	3.42	3.25
Brake Lube Flow(gpm)	0.63	0.66	0.67	0.67	0.59
Ambient (oF)	76	79	78	78	77
Temp into F.D. (oF)				182	168
Temp inside F.D. (oF)				196	198

	07:35:02	08:06:18	08:10:03	08:15:00	08:20:00
FD Output Power (hp)	124	126	125	125	127
Output Torque(lb-ft)	2499	2581	2623	2662	2767
FD Output Speed(rpm)	260	256	250	247	242
FD Input Speed (rpm)	1164	1147	1121	1105	1082
Pump Speed (rpm)	2185	2036	2036	2037	2039
Lo Rnge Clutch (psi)	9	10	10	10	10
Hi Rnge Clutch (psi)	236	229	231	233	230
Pump P Pressure(psi)	419	433	426	422	431
Pump S Pressure(psi)	5054	5495	5519	5440	5605
Pump Control Volt(V)	8.0	8.2	8.2	8.2	8.2
Control Oil Flow(gpm)	3.31	3.25	3.33	3.38	3.22
Brake Lube Flow(gpm)	0.62	0.57	0.62	0.65	0.57
Ambient (oF)	74	71	71	71	72
Temp into F.D. (oF)			184		166
Temp inside F.D. (oF)			199		193

	06:25:00	08:30:02	08:35:00	08:46:48	07:50:03
FD Output Power (hp)	119	121	121	0	65
Output Torque(lb-ft)	2567	2677	2670	86	768
FD Output Speed(rpm)	241	238	238	0	441
FD Input Speed (rpm)	1076	1067	1063	0	1304
Pump Speed (rpm)	2042	2040	2042	2082	2160
Lo Rnge Clutch (psi)	10	10	10	3	8
Hi Rnge Clutch (psi)	229	229	229	0	240
Pump P Pressure(psi)	418	421	423	481	443
Pump S Pressure(psi)	5398	5457	5433	393	3363
Pump Control Volt(V)	8.2	8.2	8.2	-0.0	10.6
Control Oil Flow(gpm)	3.18	3.19	3.19	0.00	6.34
Brake Lube Flow(gpm)	0.54	0.55	0.55	0.00	0.94
Ambient (oF)	72	71	71	70	74
Temp into F.D. (oF)		166	166		
Temp inside F.D. (oF)		189	190		

FINAL DRIVE

S/N 4

Table 10. S/N 004

This sheet is a summarization of the functional test conducted in accordance with this test plan.

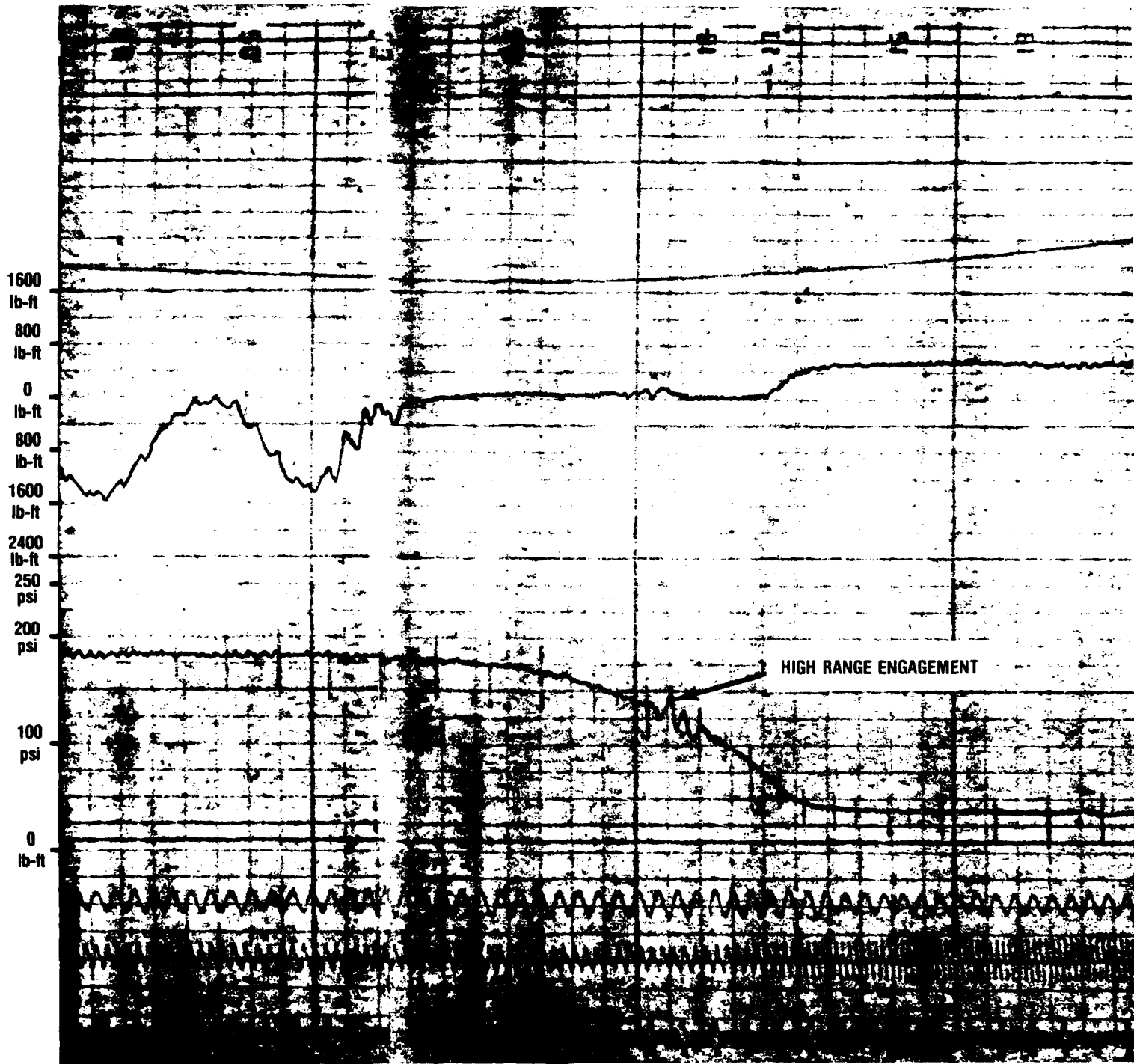
PERCENT OF RATED POWER	DIRECTION	ACCUMULATED HOURS	ACTUAL POWER OUTPUT (H.P.)
0	FORWARD	2 hrs 30 min	0 - *
	REVERSE	2 hrs 43 min	"
25 $\pm$ 2%	FORWARD	3 hrs 30 min	28 - 36
	REVERSE	3 hrs 37 min	"
50 $\pm$ 2%	FORWARD	2 hrs 30 min	59 - 66
	REVERSE	2 hrs 43 min	"
75 $\pm$ 2%	FORWARD	60 min	90 - 95
	REVERSE	63 min	"
100 $\pm$ 2%	FORWARD	30 min	120 - 129
	REVERSE	30 min	"
TOTAL HOURS	FORWARD	10 hrs	-
	REVERSE	10 hrs 36 min	-

Accumulated hours are calculated from start/stop times recorded by the computer. Actual power outputs are calculated from the output speed and torque values recorded by the computer.

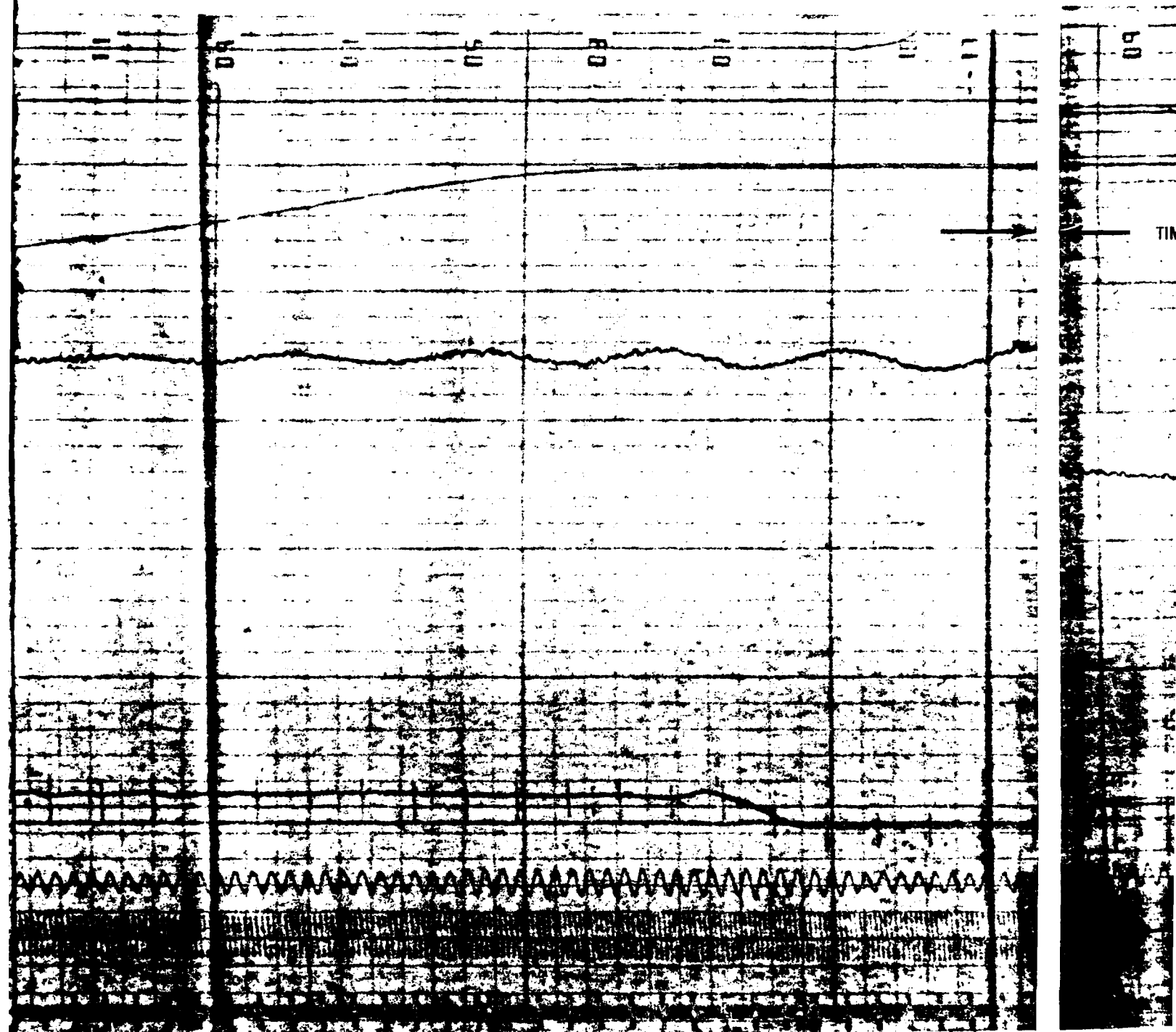
Total Shifts = 155

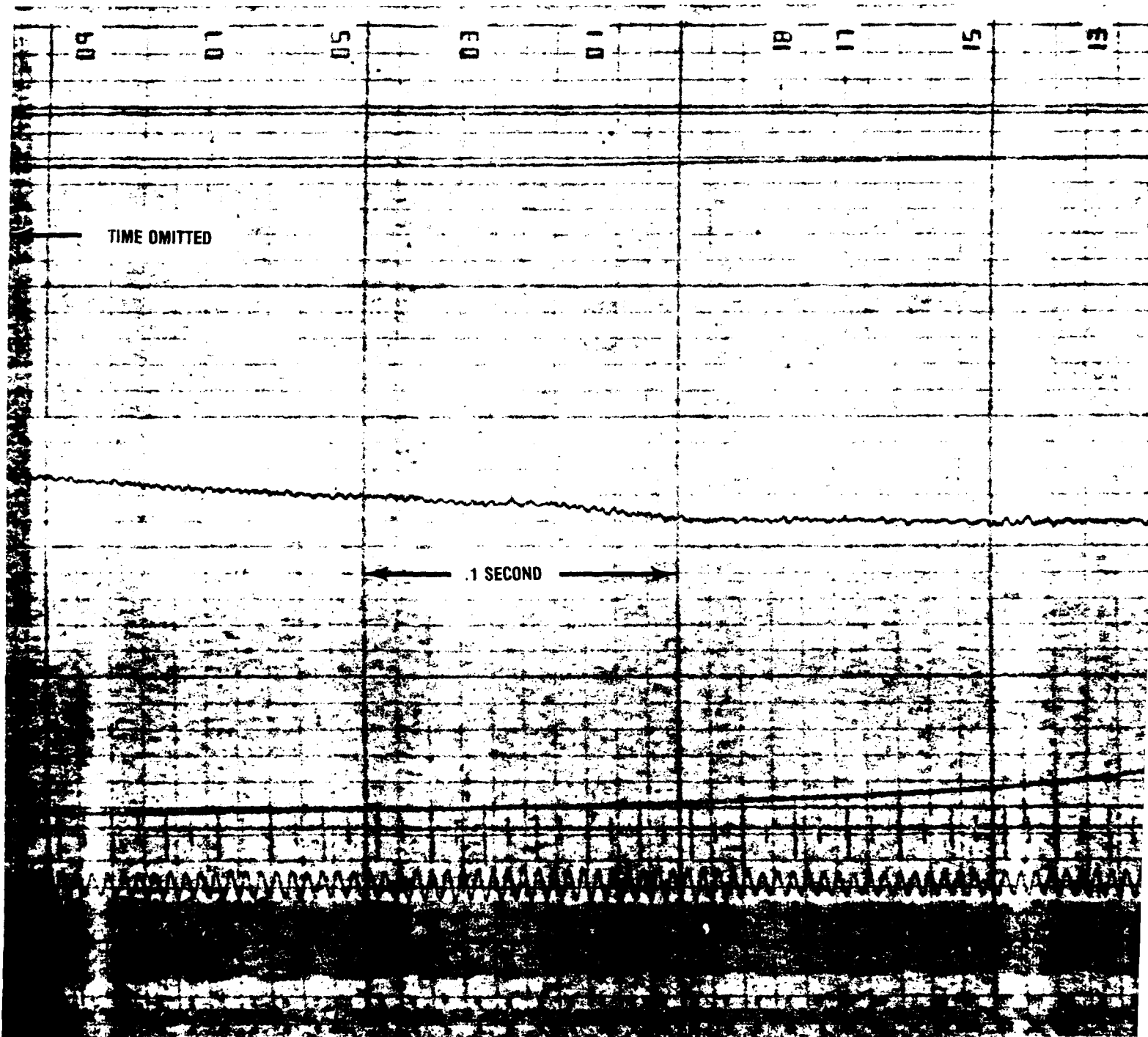
\* Actual H.P. depended on the minimum torque to turn the Dyno at that speed.

PTP10130REVA









S/N: 004

Trial: #20 10-25-84

Shift: Down-Shift

Output Torque: 1952 lb-ft

Output Speed: 200 rpm

LOW-RANGE DISENGAGEMENT

OUTPUT SPEED

INPUT SPEED

1600  
lb-ft

800  
lb-ft

0  
lb-ft

800  
lb-ft

1600  
lb-ft

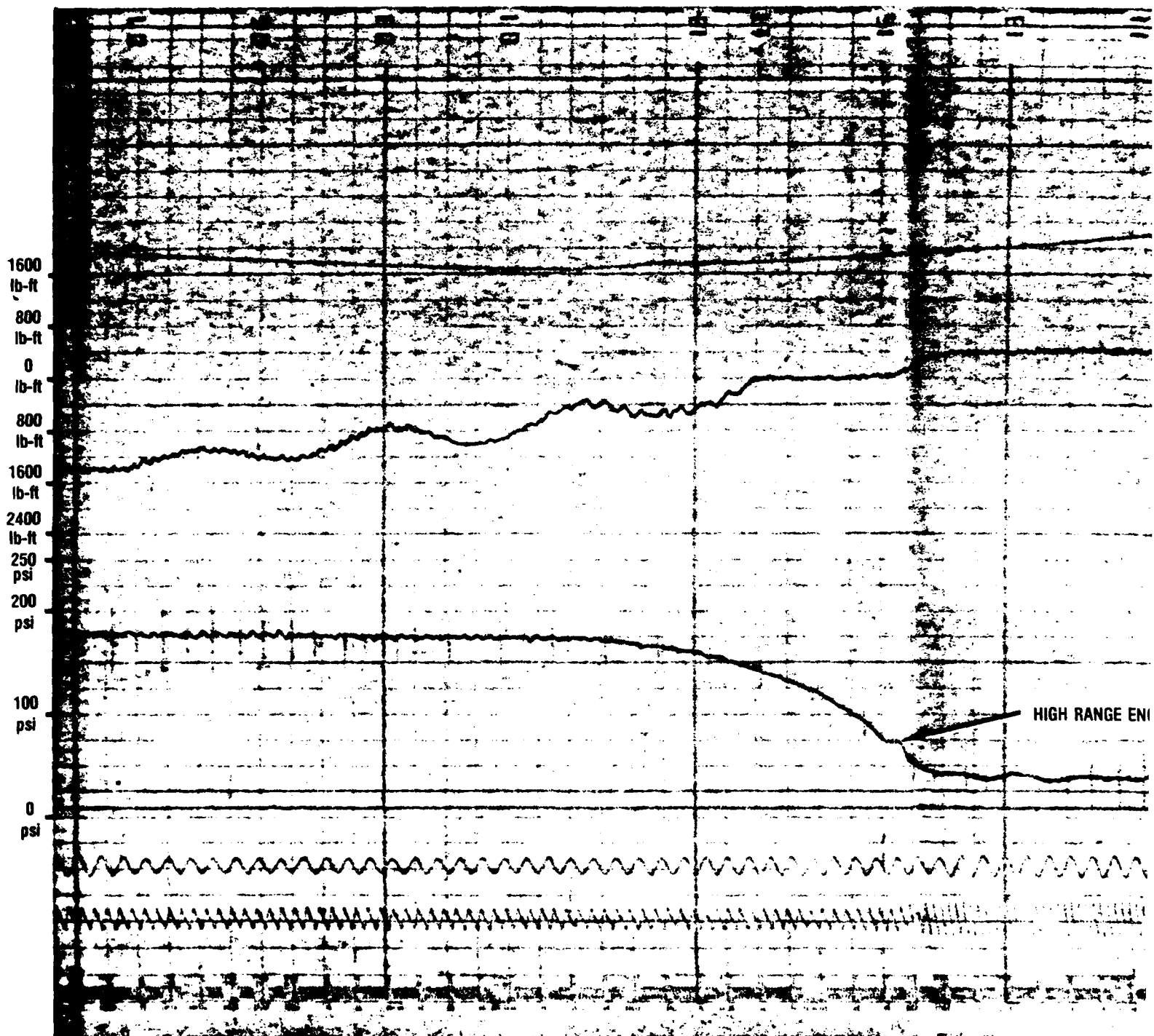
2400  
lb-ft

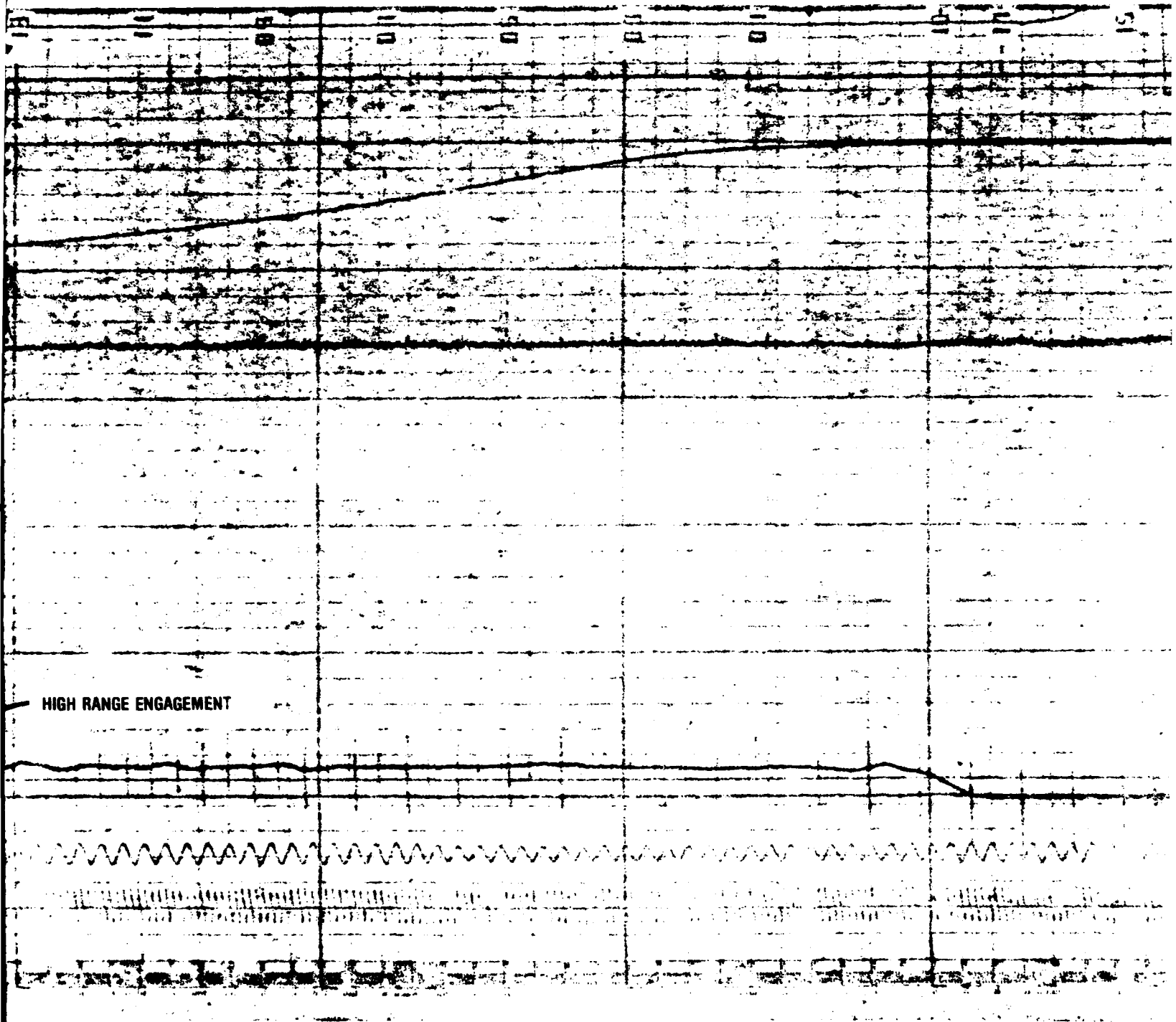
250  
psi

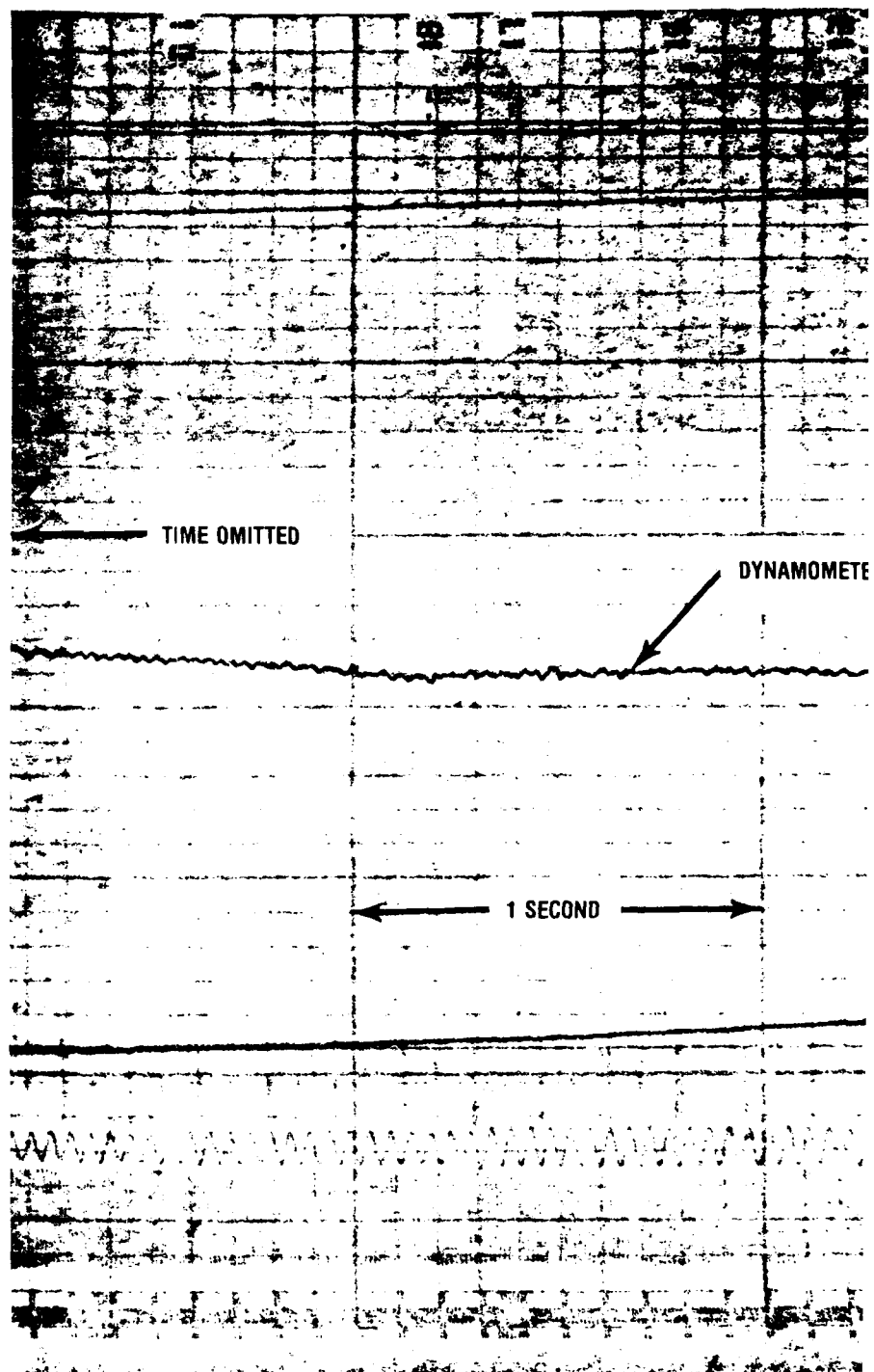
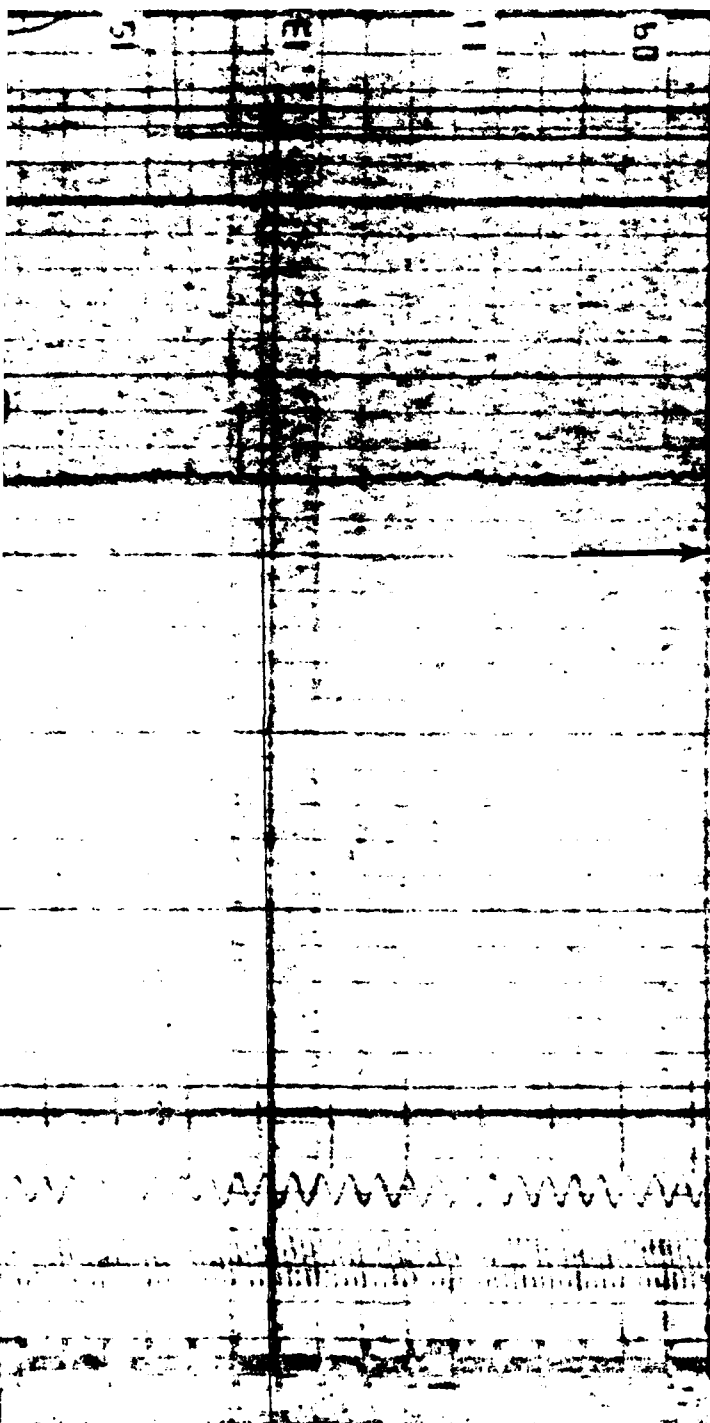
200  
psi

100  
psi

0  
psi







S/N: 004

Trial #18 10-25-84

Shift: Up-Shift

Output Torque: 2040 lb-ft

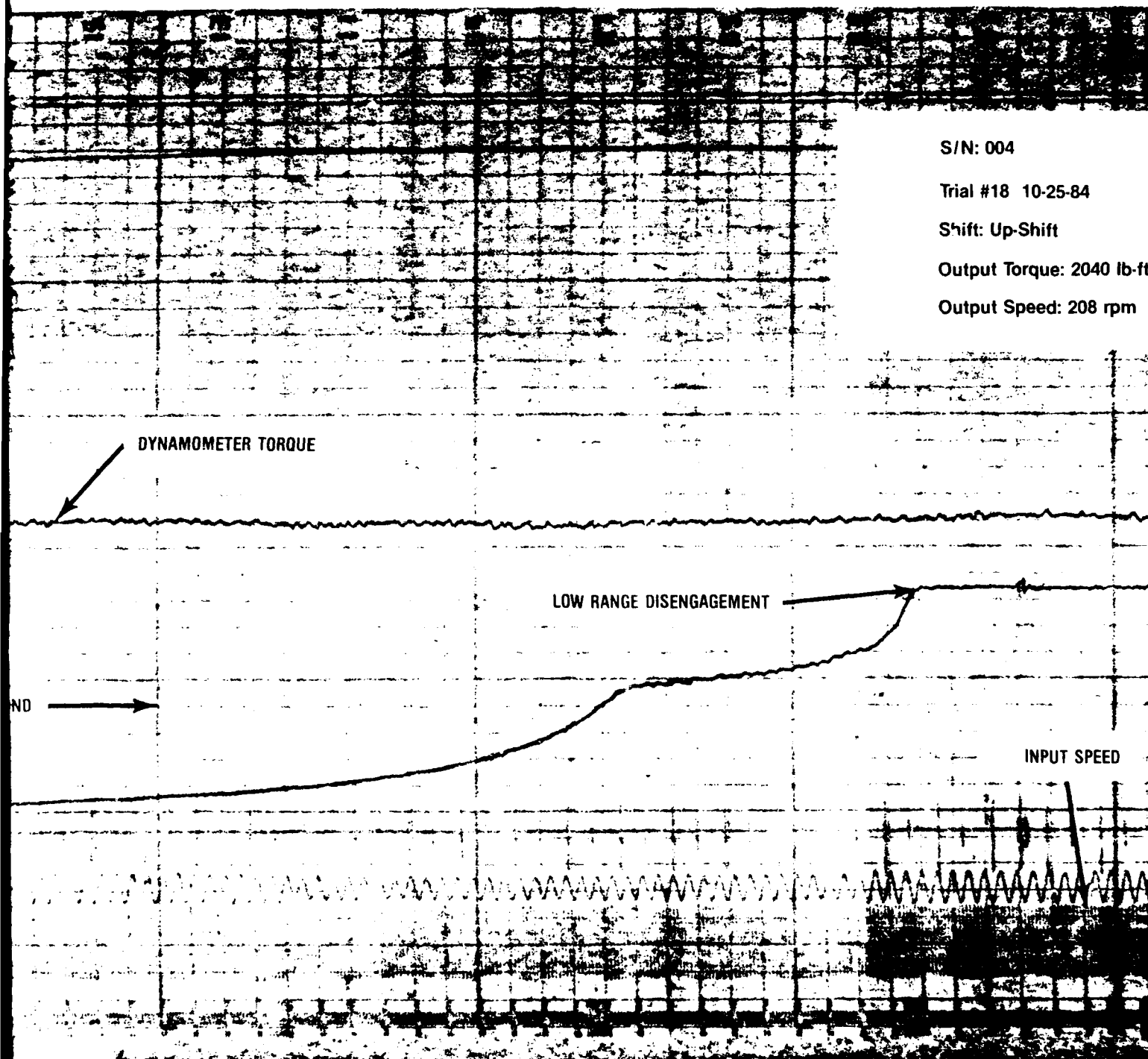
Output Speed: 208 rpm

DYNAMOMETER TORQUE

LOW RANGE DISENGAGEMENT

ND

INPUT SPEED



FMC

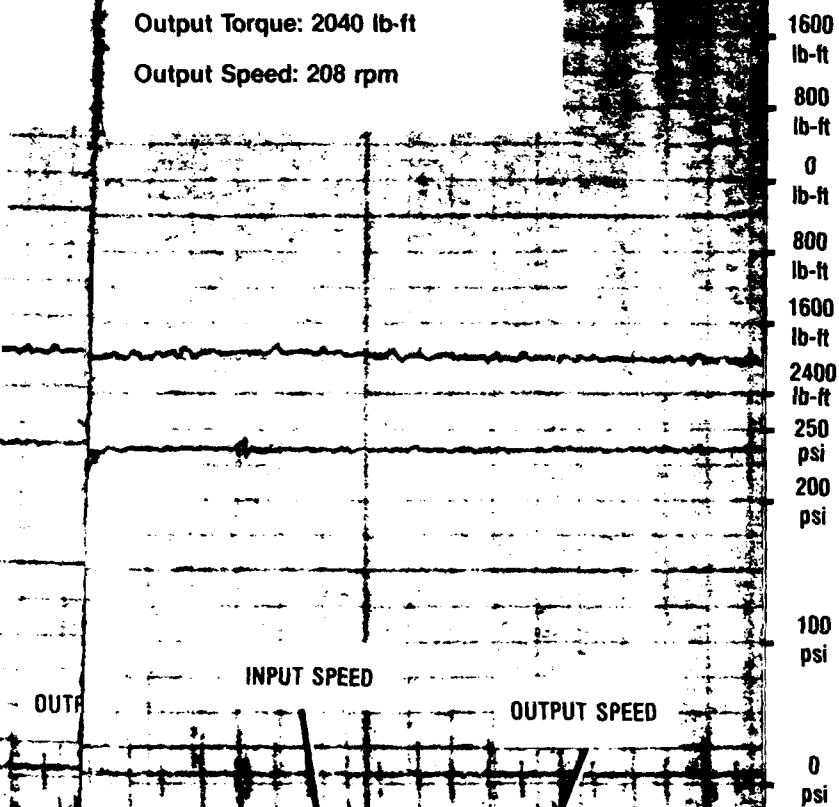
S/N: 004

Trial #18 10-25-84

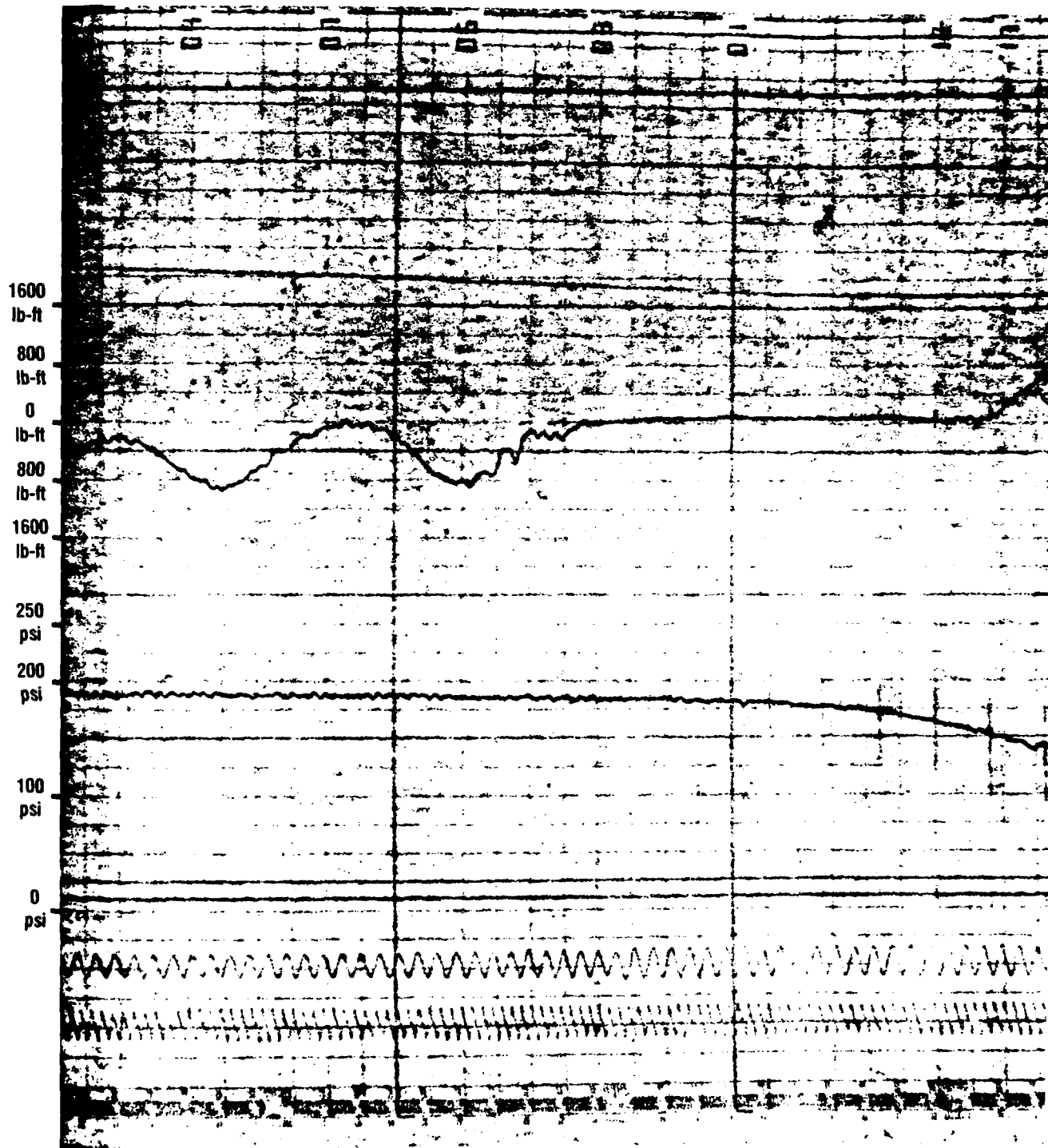
Shift: Up-Shift

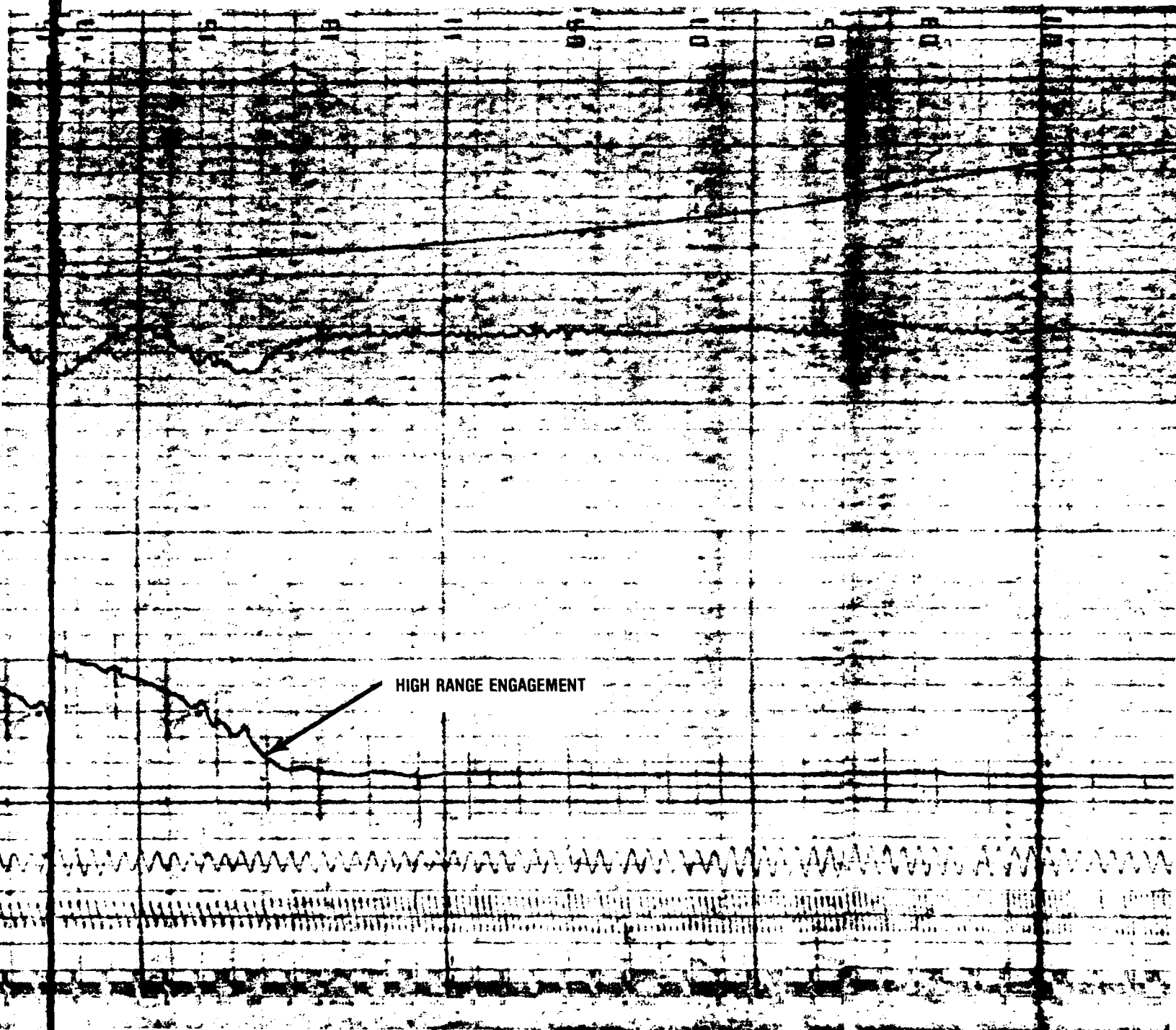
Output Torque: 2040 lb-ft

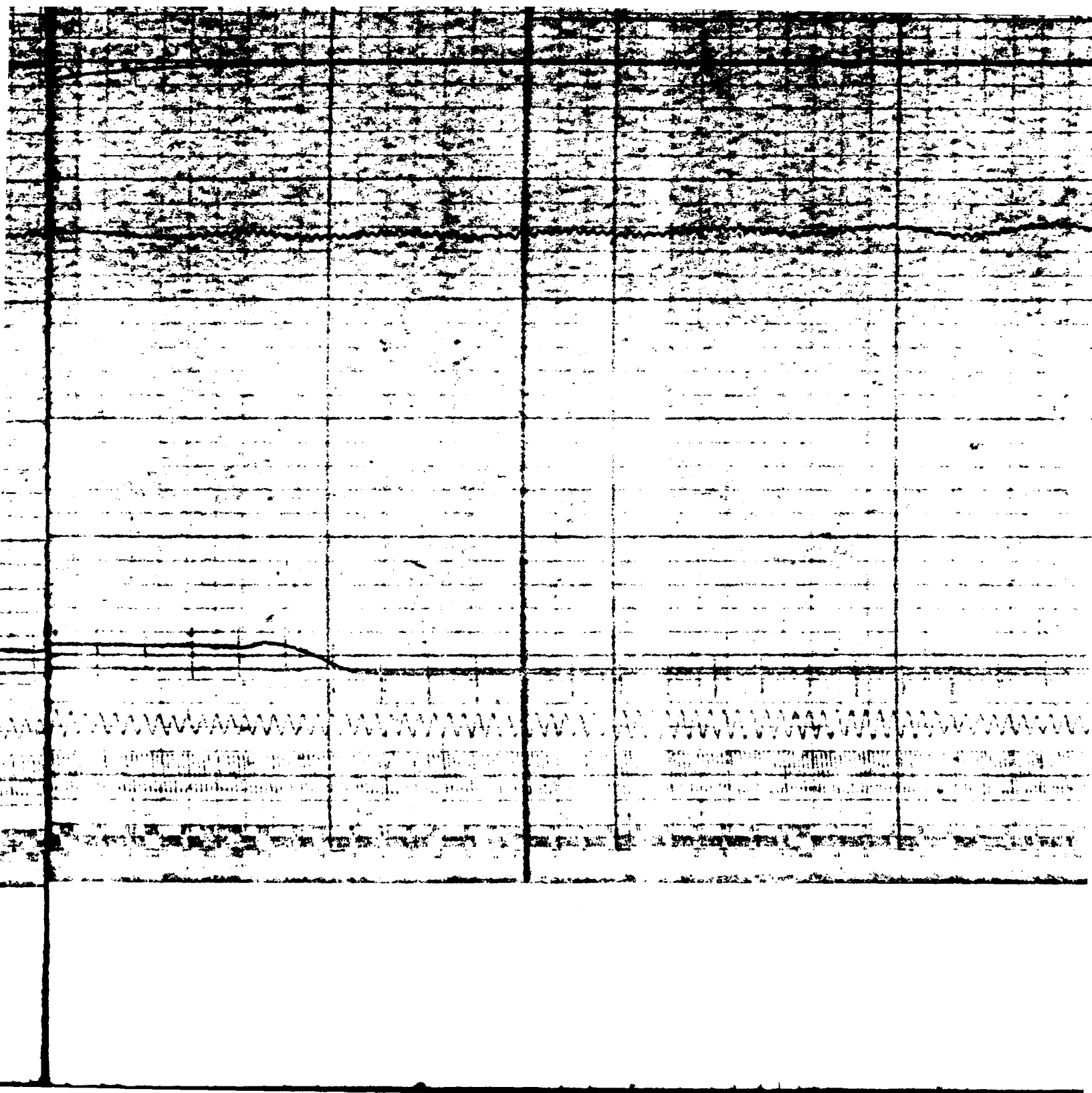
Output Speed: 208 rpm

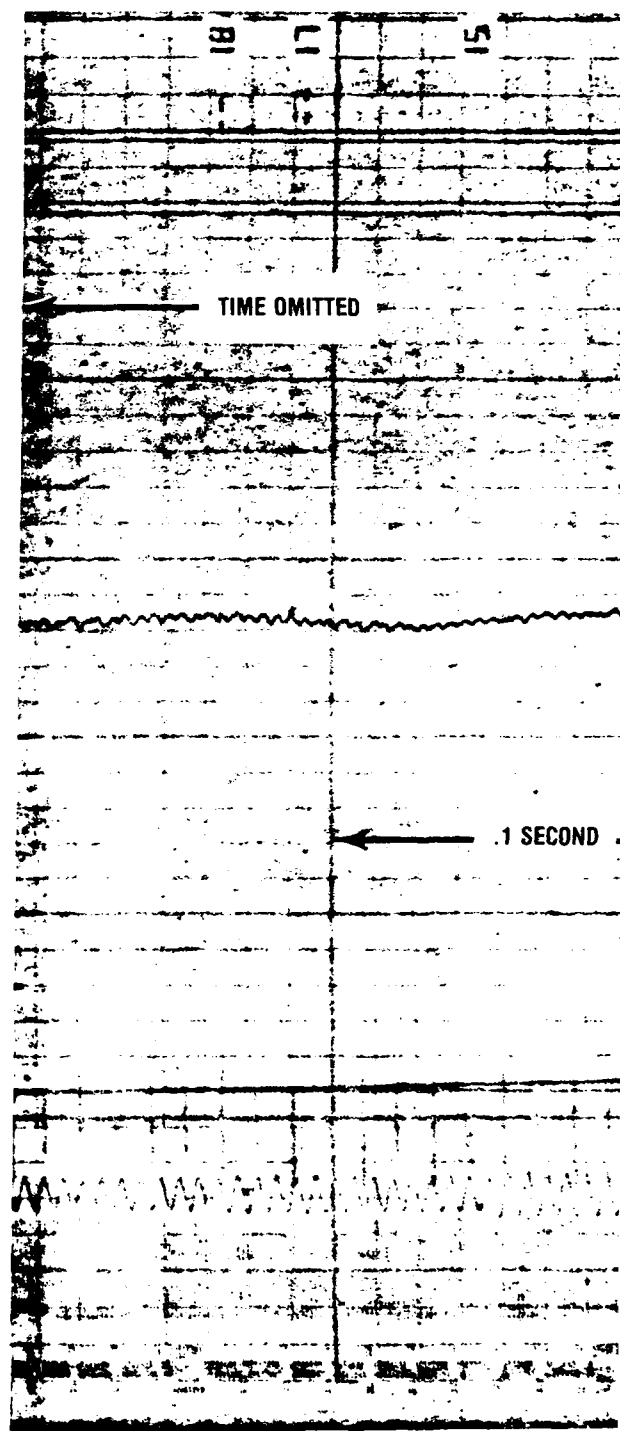
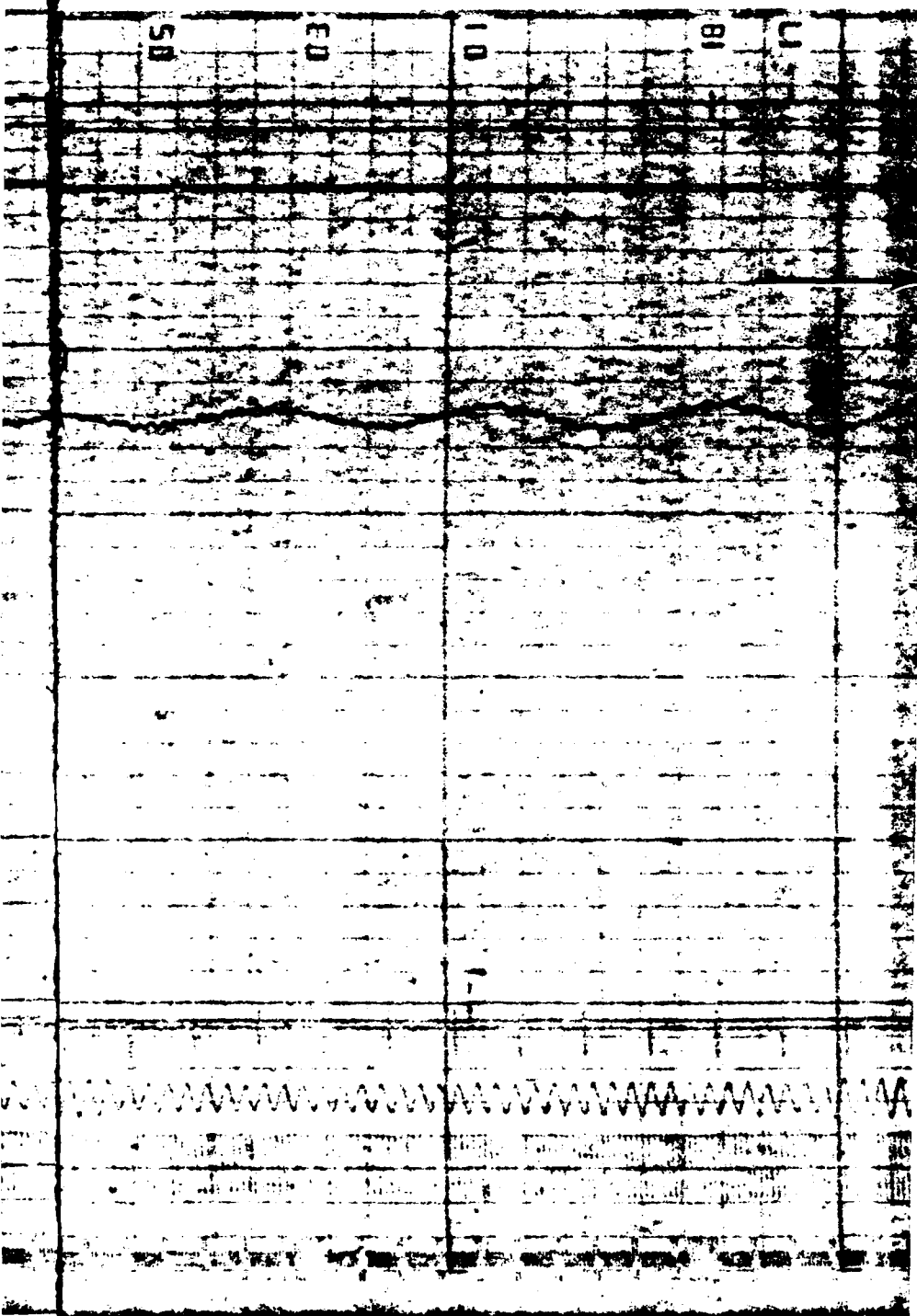












S/N: 004

Trial: #16 10-25-84

Shift: Up-Shift

Output Torque: 1122 lb-ft

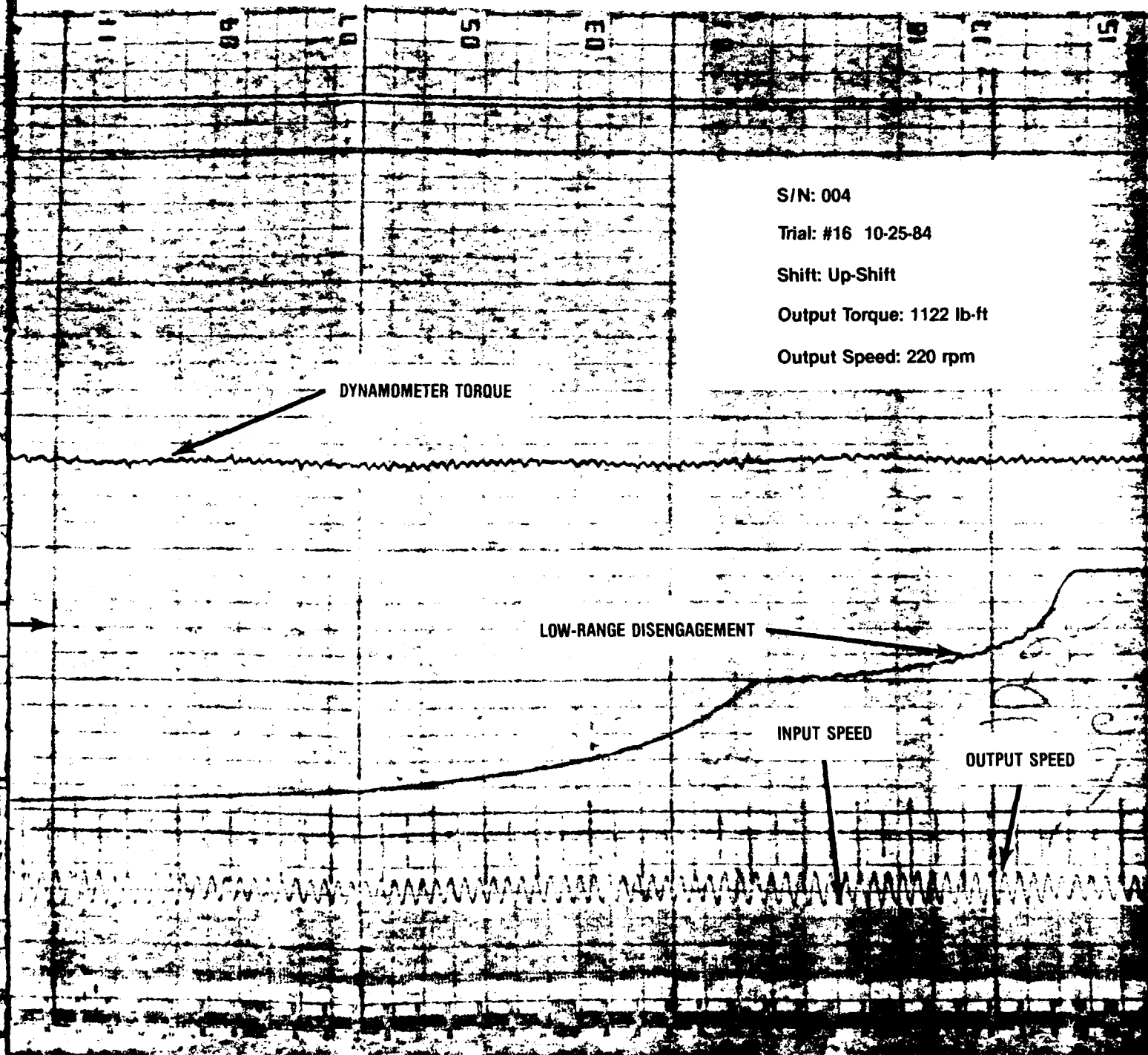
Output Speed: 220 rpm

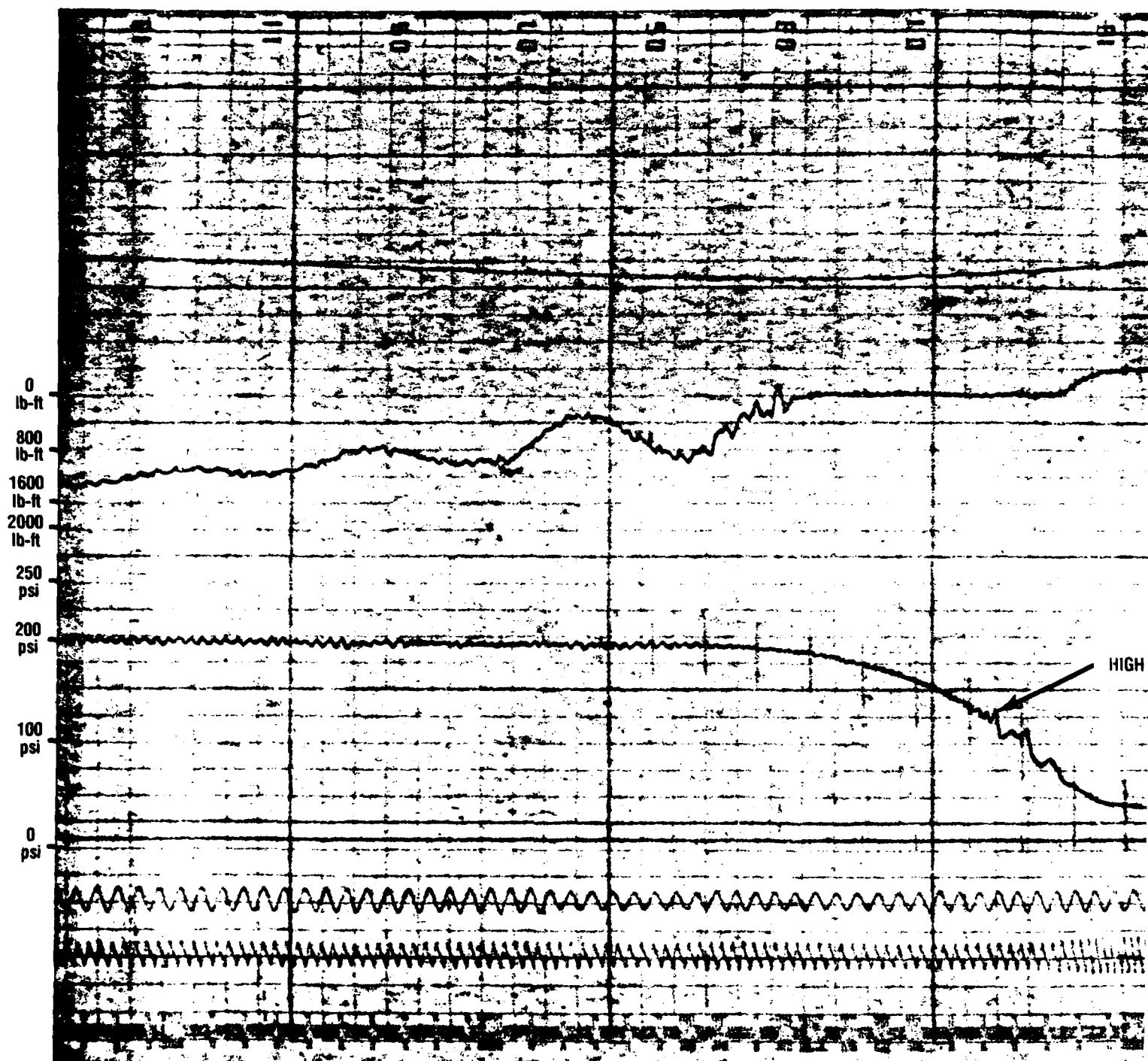
DYNAMOMETER TORQUE

LOW-RANGE DISENGAGEMENT

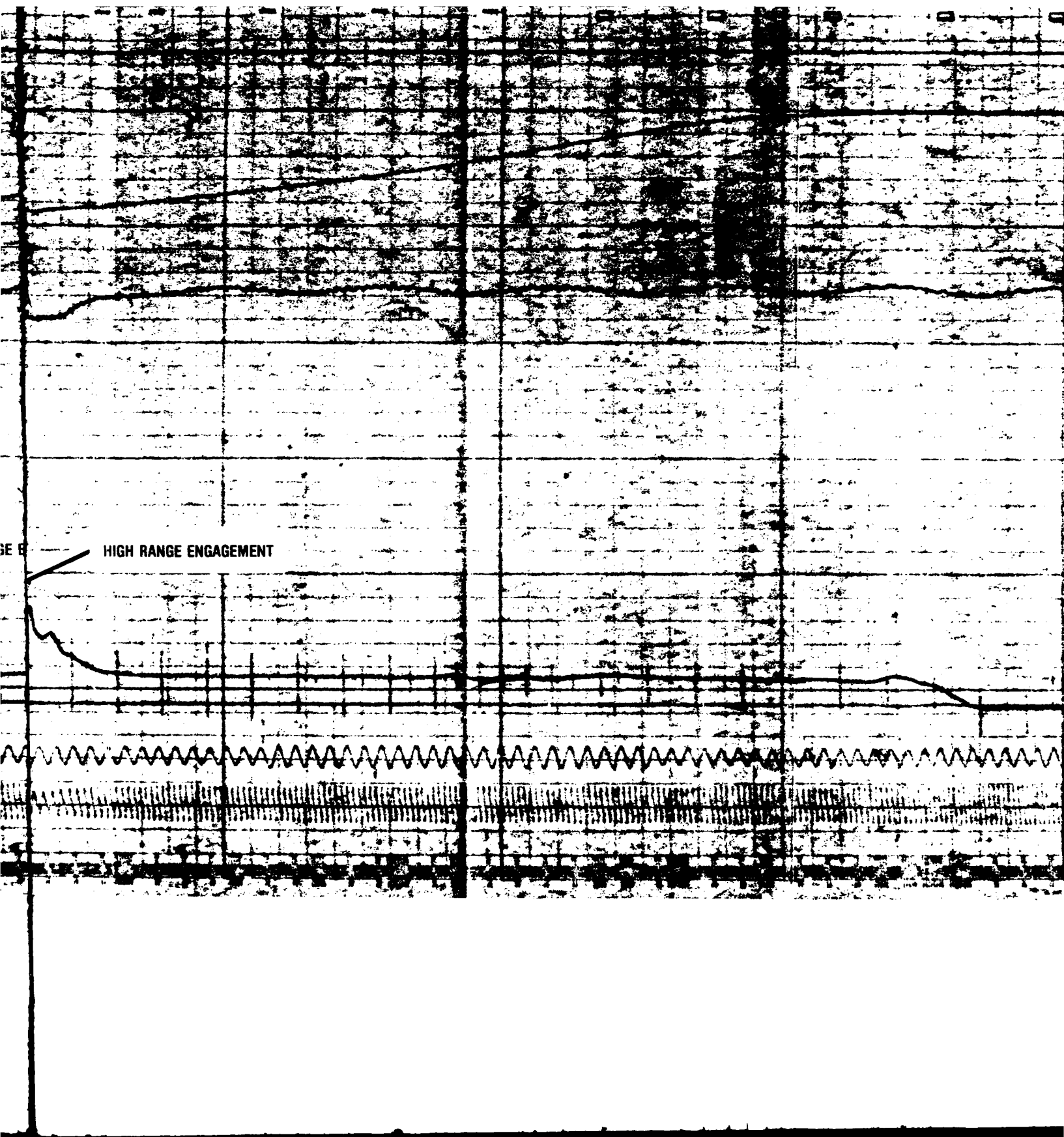
INPUT SPEED

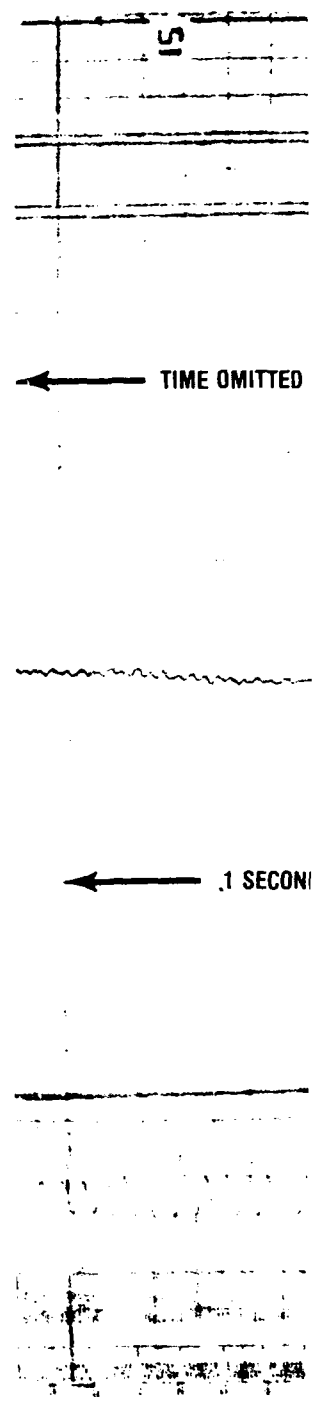
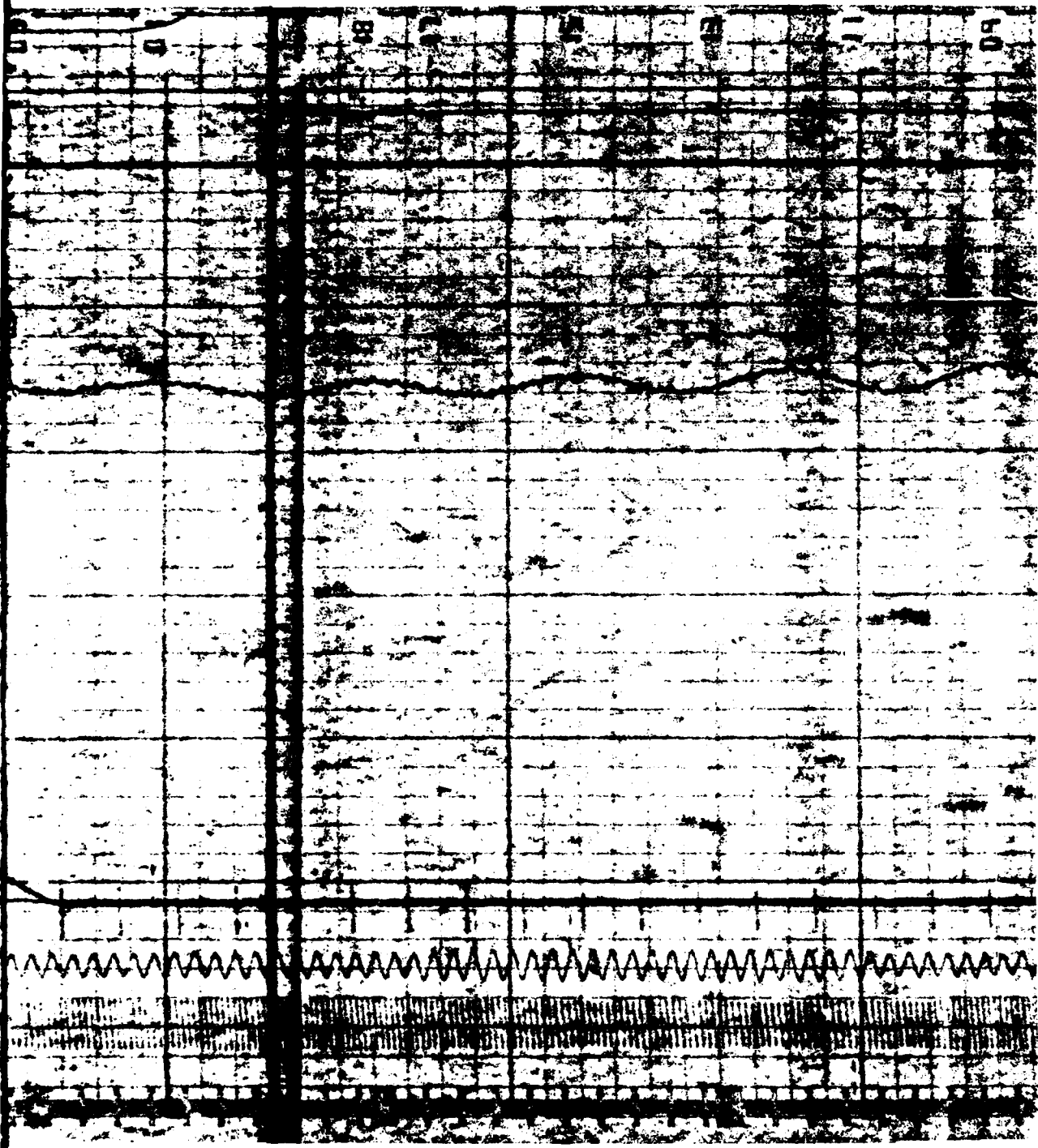
OUTPUT SPEED





SE B HIGH RANGE ENGAGEMENT





15

TIME OMITTED

.1 SECOND



EI

60

50

40

30

20

10

RE OMITTED

S/N: 004

Trial: #19 10-25-84

Shift: Up-Shift

Output Torque: 2091 lb-ft

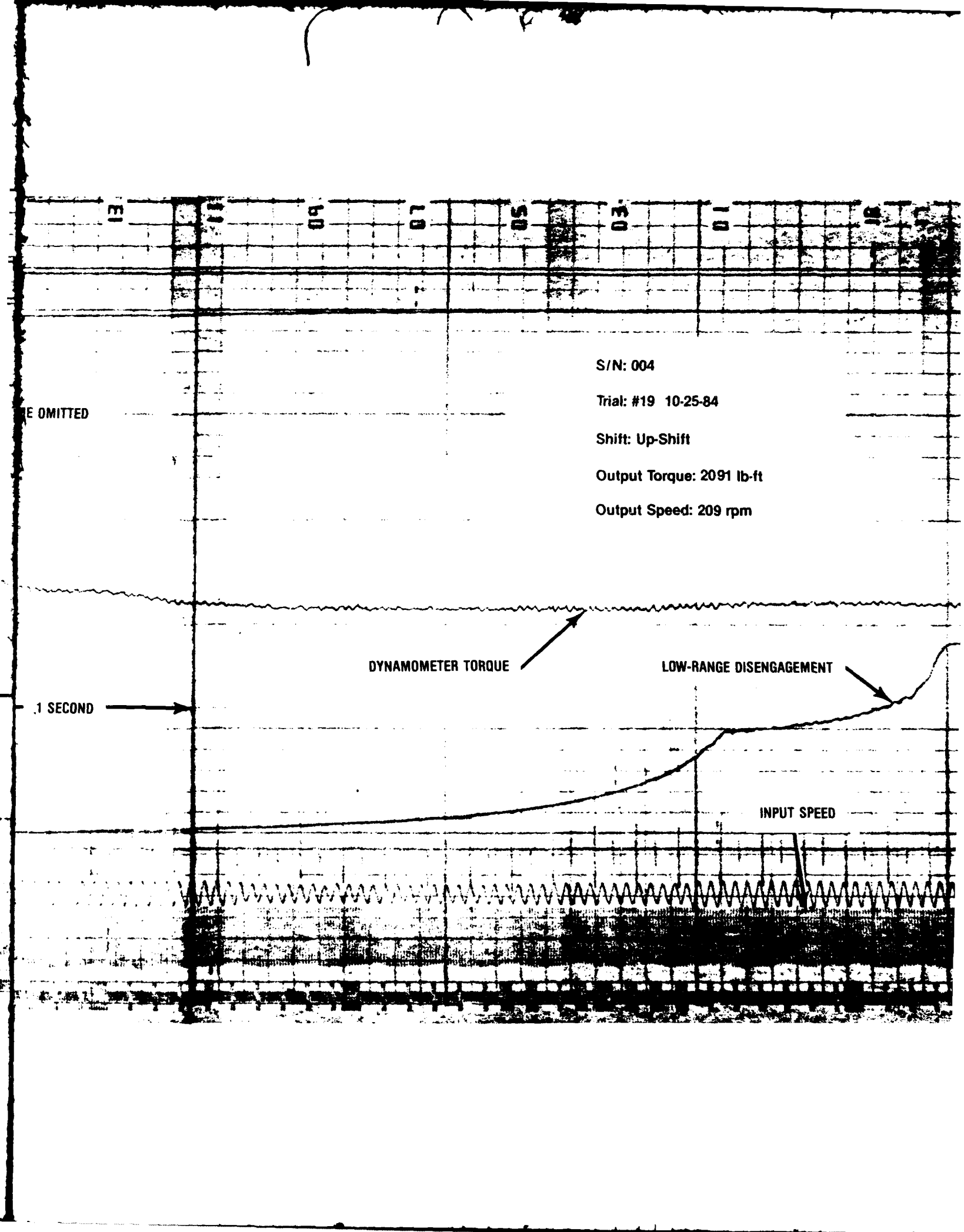
Output Speed: 209 rpm

DYNAMOMETER TORQUE

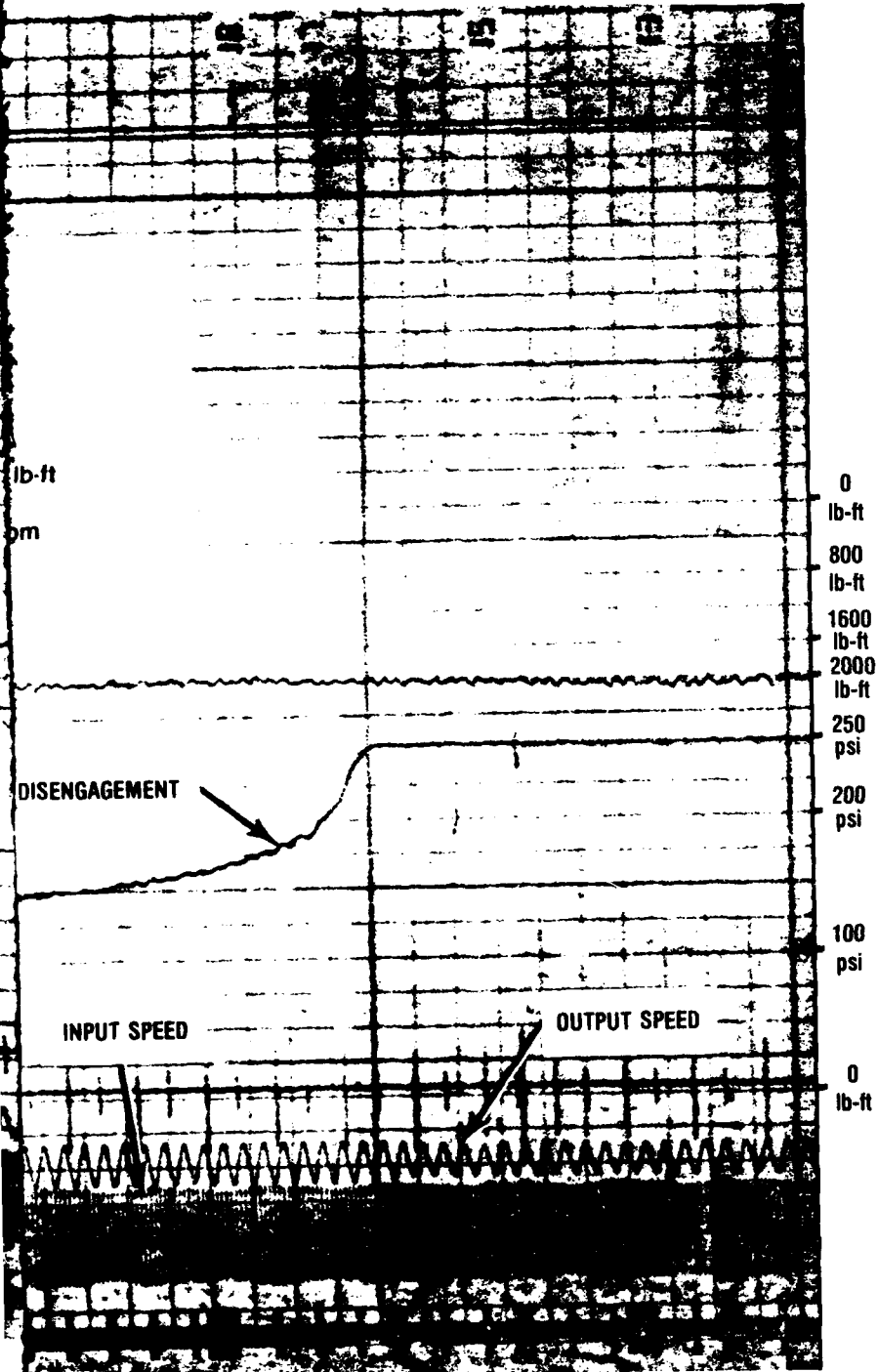
LOW-RANGE DISENGAGEMENT

.1 SECOND

INPUT SPEED



FMC



Test Engineer: Nadine Barr

Date: 18:19:84

Final Drive S/N 4

Run No. 1

	14:51:32	14:55:03	15:00:00	15:05:04	15:10:01
FD Output Power (hp)	20	20	18	18	0
Output Torque(lb-ft)	1036	1028	967	980	-50
FD Output Speed(rpm)	102	100	99	98	0
FD Input Speed (rpm)	1073	1052	1035	1029	0
Pump Speed (rpm)	2068	2072	2073	2075	2096
Lo Rnge Clutch (psi)	265	261	200	240	9
Hi Rnge Clutch (psi)	8	9	7	8	7
Pump P Pressure(psi)	468	461	461	454	484
Pump S Pressure(psi)	1563	1507	1435	1411	397
Pump Control Volt(V)	6.9	6.9	6.9	6.9	-0.0
Control Oil Flow(gpm)	1.38	1.46	1.21	1.55	1.49
Brake Lube Flow(gpm)	1.08	1.12	0.96	1.16	0.79
Ambient (oF)	70	71	71	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:15:00	15:20:00	15:25:00	15:30:00	15:35:00
FD Output Power (hp)	7	7	6	6	13
Output Torque(lb-ft)	299	272	260	262	331
FD Output Speed(rpm)	127	127	127	127	203
FD Input Speed (rpm)	568	567	567	567	910
Pump Speed (rpm)	2083	2090	2091	2092	2092
Lo Rnge Clutch (psi)	10	10	10	10	10
Hi Rnge Clutch (psi)	233	243	223	229	206
Pump P Pressure(psi)	456	457	457	456	443
Pump S Pressure(psi)	1286	1240	1232	1222	2073
Pump Control Volt(V)	5.7	5.7	5.7	5.7	7.1
Control Oil Flow(gpm)	3.60	3.67	3.46	3.50	3.27
Brake Lube Flow(gpm)	0.90	0.89	0.82	0.83	0.76
Ambient (oF)	72	72	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:40:01	15:44:00	11:10:04	11:15:04	11:20:03
FD Output Power (hp)	13	0	-32	-32	-32
Output Torque(lb-ft)	304	-0	-517	-512	-516
FD Output Speed(rpm)	225	0	326	325	326
FD Input Speed (rpm)	*2357	0	1460	1458	1464
Pump Speed (rpm)	2091	70	2072	2073	2076
Lo Rnge Clutch (psi)	246	4	-401	-580	-814
Hi Rnge Clutch (psi)	9	0	233	234	234
Pump P Pressure(psi)	450	-3	2539	2544	2524
Pump S Pressure(psi)	1450	-4	366	366	367
Pump Control Volt(V)	11.1	-0.0	3.7	8.7	8.7
Control Oil Flow(gpm)	1.21	0.00	3.30	3.34	3.36
Brake Lube Flow(gpm)	0.76	0.00	0.80	0.82	0.84
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

\* Input Speed Calculated

# Two-Speed Final Drive

Test Engineer: Nadine Barr

Date: 18:22:84

Final Drive S/N 4

Run No. 2

	09:10:24	09:15:01	09:20:02	09:25:02	09:30:04
FD Output Power (hp)	35	23	33	30	30
Output Torque(lb-ft)	797	566	783	768	715
FD Output Speed (rpm)	230	225	222	219	218
FD Input Speed (rpm)	1030	1009	994	983	975
Pump Speed (rpm)	2156	2160	2161	2163	2164
Lo Rnge Clutch (psi)	11	11	11	5	5
Hi Rnge Clutch (psi)	229	228	228	254	212
Pump P Pressure(psi)	463	456	454	452	453
Pump S Pressure(psi)	2479	2180	2223	2144	2141
Pump Control Volt(V)	6.7	6.7	6.7	6.7	6.7
Control Oil Flow(gpm)	3.64	3.78	4.00	3.46	3.08
Brake Lube Flow(gpm)	0.96	1.04	0.94	1.00	0.87
Ambient (oF)	68	72	78	77	74
Temp into F.D. (oF)	155		175		
Temp inside F.D.(oF)	167		186		

	09:35:03	09:40:01	09:45:02	09:50:05	09:55:03
FD Output Power (hp)	32	32	31	28	35
Output Torque(lb-ft)	587	602	590	528	660
FD Input Speed (rpm)	283	282	280	279	279
FD Input Speed (rpm)	1270	1260	1256	1251	1247
Pump Speed (rpm)	2162	2161	2162	2164	2165
Lo Rnge Clutch (psi)	5	5	5	5	5
Hi Rnge Clutch (psi)	231	236	211	241	246
Pump P Pressure(psi)	449	448	445	440	451
Pump S Pressure(psi)	2101	2176	2083	2062	2122
Pump Control Volt(V)	7.5	7.5	7.5	7.5	7.5
Control Oil Flow(gpm)	3.19	3.25	3.05	3.32	3.31
Brake Lube Flow(gpm)	0.88	0.90	0.84	0.95	0.93
Ambient (oF)	72	72	73	78	75
Temp into F.D. (oF)	171				
Temp inside F.D.(oF)	194				

	10:00:02	10:05:02	10:10:04	10:15:00	10:20:00
FD Output Power (hp)	32	35	30	30	28
Output Torque(lb-ft)	599	670	566	483	454
FD Input Speed (rpm)	278	277	278	326	326
FD Input Speed (rpm)	1243	1243	1245	1458	1461
Pump Speed (rpm)	2166	2168	2168	2164	2165
Lo Rnge Clutch (psi)	5	5	5	5	5
Hi Rnge Clutch (psi)	224	233	236	247	255
Pump P Pressure(psi)	442	447	447	444	450
Pump S Pressure(psi)	2017	2077	2068	2151	2131
Pump Control Volt(V)	7.5	7.5	7.5	8.4	8.4
Control Oil Flow(gpm)	3.11	3.12	3.17	3.44	3.53
Brake Lube Flow(gpm)	0.85	0.84	0.87	1.04	1.08
Ambient (oF)	73	72	71	71	71
Temp into F.D. (oF)			168		
Temp inside F.D.(oF)		4-76	194		

Date:10:22:94

	10:25:03	10:30:00	10:35:02	10:40:00	10:45:03
FD Output Power (hp)	31	32	29	29	34
Output Torque(lb-ft)	499	511	471	464	542
FD Output Speed (rpm)	326	326	326	326	326
FD Input Speed (rpm)	1461	1462	1463	1463	1463
Pump Speed (rpm)	2165	2165	2169	2170	2169
Lo Rnge Clutch (psi)	5	5	5	5	5
Hi Rnge Clutch (psi)	227	241	212	220	238
Pump P Pressure(psi)	445	443	449	446	445
Pump S Pressure(psi)	2128	2124	2114	2080	2100
Pump Control Volt(V)	8.5	8.4	8.5	8.4	8.5
Control Oil Flow(gpm)	3.20	3.46	3.08	3.13	3.27
Brake Lube Flow(gpm)	0.94	1.07	0.89	0.91	0.95
Ambient (oF)	76	76	73	72	71
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	10:50:01	10:55:04	11:00:05	11:05:00	11:10:01
FD Output Power (hp)	32	29	33	28	38
Output Torque(lb-ft)	513	405	465	395	458
FD Input Speed (rpm)	326	375	375	374	433
FD Input Speed (rpm)	1463	1683	1632	1679	1934
Pump Speed (rpm)	2168	2168	2169	2170	2164
Lo Rnge Clutch (psi)	5	5	5	5	5
Hi Rnge Clutch (psi)	243	244	213	247	216
Pump P Pressure(psi)	445	447	453	451	447
Pump S Pressure(psi)	2150	2303	2272	2304	2603
Pump Control Volt(V)	8.4	9.5	9.5	9.5	10.4
Control Oil Flow(gpm)	3.39	3.41	3.19	3.46	3.13
Brake Lube Flow(gpm)	1.01	1.03	0.96	1.06	0.91
Ambient (oF)	72	72	72	72	73
Temp into F.D. (oF)	173				
Temp inside F.D.(oF)	205				

	11:15:05	11:20:02	11:25:04	11:30:01	13:01:39
FD Output Power (hp)	43	26	32	34	31
Output Torque(lb-ft)	521	384	467	499	1440
FD Input Speed (rpm)	431	358	358	359	114
FD Input Speed (rpm)	1933	1601	1602	1608	1192
Pump Speed (rpm)	2168	2170	2169	2168	2058
Lo Rnge Clutch (psi)	5	5	5	5	245
Hi Rnge Clutch (psi)	226	231	250	236	6
Pump P Pressure(psi)	449	444	447	449	461
Pump S Pressure(psi)	2581	2189	2290	2244	1931
Pump Control Volt(V)	10.4	8.9	8.9	8.9	7.4
Control Oil Flow(gpm)	3.29	3.23	3.35	3.27	1.08
Brake Lube Flow(gpm)	0.99	0.95	0.97	0.96	0.93
Ambient (oF)	73	73	72	72	69
Temp into F.D. (oF)	178				
Temp inside F.D.(oF)	227				

Date:10:22:84

	13:05:01	13:10:00	13:15:01	13:20:03	13:25:03
FD Output Power (hp)	30	30	29	33	33
Output Torque(lb-ft)	1385	1384	1323	1511	1517
FD Output Speed (rpm)	115	115	114	113	113
FD Input Speed (rpm)	1203	1201	1195	1183	1179
Pump Speed (rpm)	2060	2060	2063	2062	2063
Lo Rnge Clutch (psi)	257	243	245	246	250
Hi Rnge Clutch (psi)	6	7	7	8	8
Pump P Pressure(psi)	458	456	452	452	450
Pump S Pressure(psi)	1831	1791	1733	1647	1830
Pump Control Volt(V)	7.4	7.4	7.4	7.4	7.4
Control Oil Flow(gpm)	1.28	1.38	1.48	1.39	1.45
Brake Lube Flow(gpm)	1.04	1.07	1.15	0.96	0.99
Ambient (oF)	76	79	75	73	73
Temp into F.D. (oF)	147			168	
Temp inside F.D. (oF)	159			174	

	13:30:04	13:35:05	13:40:03	13:45:00	13:50:05
FD Output Power (hp)	33	31	31	30	30
Output Torque(lb-ft)	1528	1433	1455	1400	1416
FD Input Speed (rpm)	112	112	112	112	112
FD Input Speed (rpm)	1177	1174	1172	1173	1176
Pump Speed (rpm)	2064	2065	2066	2068	2071
Lo Rnge Clutch (psi)	232	258	246	256	215
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	453	450	451	452	451
Pump S Pressure(psi)	1829	1790	1788	1778	1789
Pump Control Volt(V)	7.4	7.4	7.4	7.4	7.4
Control Oil Flow(gpm)	1.07	1.11	1.13	1.38	1.34
Brake Lube Flow(gpm)	0.74	0.78	0.81	0.95	0.87
Ambient (oF)	73	72	72	72	72
Temp into F.D. (oF)					176
Temp inside F.D. (oF)					182

Test Engineer: Nadine Barr

Date: 10/22/84

Final Drive S/N 4

Run No. 2

	13:55:00	14:00:04	14:05:00	14:10:06	14:15:01
FD Output Power (hp)	33	32	31	32	64
Output Torque(lb-ft)	1307	1264	1239	1242	2659
FD Output Speed(rpm)	133	134	133	134	126
FD Input Speed (rpm)	1400	1399	1398	1400	1323
Pump Speed (rpm)	2070	2073	2072	2072	2062
Lo Rnge Clutch (psi)	233	255	258	261	262
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	453	447	450	450	447
Pump S Pressure(psi)	1851	1818	1799	1787	2941
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Control Oil Flow(gpm)	1.35	1.23	1.28	1.39	1.54
Brake Lube Flow(gpm)	0.87	0.83	0.90	1.00	1.10
Ambient (oF)	73	71	72	72	70
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:20:03	14:25:00	14:30:02	14:35:02	14:40:04
FD Output Power (hp)	61	61	62	62	61
Output Torque(lb-ft)	2550	2562	2580	2609	2562
FD Output Speed(rpm)	126	125	125	125	125
FD Input Speed (rpm)	1319	1315	1311	1312	1313
Pump Speed (rpm)	2066	2065	2065	2067	2069
Lo Rnge Clutch (psi)	241	254	204	210	222
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	449	444	444	439	445
Pump S Pressure(psi)	2880	2862	2866	2879	2838
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Control Oil Flow(gpm)	1.56	1.39	1.22	1.12	1.05
Brake Lube Flow(gpm)	1.10	0.93	0.76	0.63	0.63
Ambient (oF)	73	72	71	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	14:45:02	14:50:02	14:55:04	15:00:01	15:05:05
FD Output Power (hp)	61	61	61	59	62
Output Torque(lb-ft)	2225	2207	2219	2125	2220
FD Output Speed(rpm)	145	145	145	145	146
FD Input Speed (rpm)	1515	1516	1521	1520	1525
Pump Speed (rpm)	2071	2074	2073	2078	2079
Lo Rnge Clutch (psi)	251	252	263	254	247
Hi Rnge Clutch (psi)	7	8	8	8	8
Pump P Pressure(psi)	441	446	444	445	444
Pump S Pressure(psi)	2842	2838	2810	2830	2811
Pump Control Volt(V)	9.5	9.5	9.5	9.5	9.5
Control Oil Flow(gpm)	1.47	1.63	1.78	1.57	1.54
Brake Lube Flow(gpm)	1.07	1.18	1.29	1.13	1.09
Ambient (oF)	72	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Date: 10:22:24

	15:10:00	15:15:01	15:20:01	15:25:01	15:30:03
FD Output Power (hp)	60	62	61	60	60
Output Torque(lb-ft)	1870	1961	1928	1880	1882
FD Output Speed(rpm)	169	167	167	167	167
FD Input Speed (rpm)	1757	1748	1748	1748	1752
Pump Speed (rpm)	2020	2077	2080	2081	2083
Lo Rnge Clutch (psi)	255	257	257	251	250
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	442	444	443	446	447
Pump S Pressure(psi)	2827	2905	2914	2999	2911
Pump Control Volt(V)	10.4	10.4	10.4	10.4	10.4
Control Oil Flow(gpm)	1.53	1.54	1.52	1.48	1.48
Brake Lube Flow(gpm)	1.10	1.10	1.09	1.07	1.06
Ambient (oF)	72	72	71	71	77
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	15:35:02	15:40:00	15:45:01	15:50:00	15:55:05
FD Output Power (hp)	-34	-35	-34	-33	-34
Output Torque(lb-ft)	-1517	-1552	-1500	-1364	-1390
FD Output Speed(rpm)	119	120	120	128	128
FD Input Speed (rpm)	1249	1255	1259	1338	1339
Pump Speed (rpm)	2088	2087	2087	2069	2068
Lo Rnge Clutch (psi)	261	267	229	256	255
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	2265	2275	2267	2230	2233
Pump S Pressure(psi)	368	369	369	369	369
Pump Control Volt(V)	7.7	7.7	7.7	8.0	8.0
Control Oil Flow(gpm)	1.47	1.62	1.59	1.25	1.27
Brake Lube Flow(gpm)	1.09	1.19	1.13	0.83	0.84
Ambient (oF)	75	73	72	72	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	16:00:01	16:05:01	16:10:00	16:15:02	16:20:00
FD Output Power (hp)	-34	-30	-36	-35	-35
Output Torque(lb-ft)	-1382	-1027	-1249	-1232	-1204
FD Output Speed(rpm)	128	151	151	151	151
FD Input Speed (rpm)	1343	1587	1579	1579	1576
Pump Speed (rpm)	2089	2089	2088	2090	2090
Lo Rnge Clutch (psi)	257	248	247	252	250
Hi Rnge Clutch (psi)	8	8	8	8	8
Pump P Pressure(psi)	2207	2165	2350	2329	2339
Pump S Pressure(psi)	369	369	369	369	366
Pump Control Volt(V)	8.0	9.1	9.1	9.1	9.1
Control Oil Flow(gpm)	1.28	1.39	1.39	1.43	1.42
Brake Lube Flow(gpm)	0.86	0.96	0.96	0.98	0.97
Ambient (oF)	72	72	73	73	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					



Date:10:22:84

	16:25:06	16:30:03	16:35:01	16:40:02	16:55:43
FD Output Power (hp)	-31	-33	-35	-33	-50
Output Torque(lb-ft)	-623	-648	-599	-576	-585
FD Output Speed(rpm)	264	264	304	303	445
FD Input Speed (rpm)	1183	1183	1362	1360	1980
Pump Speed (rpm)	2087	2089	2092	2091	2090
Lo Rnge Clutch (psi)	11	10	7	7	7
Hi Rnge Clutch (psi)	231	228	238	235	232
Pump P Pressure(psi)	2963	2939	2692	2731	3419
Pump S Pressure(psi)	364	366	362	366	363
Pump Control Volt(V)	7.5	7.5	8.2	8.2	10.7
Control Oil Flow(gpm)	3.97	4.00	3.70	3.70	3.72
Brake Lube Flow(gpm)	1.08	1.08	1.07	1.09	1.11
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

	17:17:56	17:18:58	14:08:00	14:10:08	14:15:01
FD Output Power (hp)	-30	-29	31	32	84
Output Torque(lb-ft)	-433	-412	1239	1242	2659
FD Output Speed(rpm)	365	366	153	134	126
FD Input Speed (rpm)	1636	1639	1398	1400	1323
Pump Speed (rpm)	2095	2096	2072	2072	2062
Lo Rnge Clutch (psi)	7	7	258	261	262
Hi Rnge Clutch (psi)	235	234	8	8	8
Pump P Pressure(psi)	2752	2750	450	450	447
Pump S Pressure(psi)	366	366	1799	1787	2941
Pump Control Volt(V)	9.2	9.2	8.4	8.4	8.4
Control Oil Flow(gpm)	3.71	3.65	1.28	1.33	1.54
Brake Lube Flow(gpm)	1.10	1.08	0.90	1.00	1.10
Ambient (oF)	73	73	72	72	72
Temp into F.D. (oF)					
Temp inside F.D.(oF)					

Test Engineer: Nadine Barr

Date: 18:22:84

Final Drive S/N 4

Run No. 3

	17:20:11	17:25:01	17:30:01	17:35:02	17:40:01
FD Output Power (hp)	-31	-35	-32	-31	-31
Output Torque(lb-ft)	-451	-501	-455	-439	-445
FD Output Speed(rpm)	366	365	367	367	366
FD Input Speed (rpm)	1640	1635	1642	1644	1642
Pump Speed (rpm)	2095	2096	2096	2099	2098
Lo Rnge Clutch (psi)	7	7	7	7	7
Hi Rnge Clutch (psi)	233	235	230	229	233
Pump P Pressure(psi)	2734	2874	2852	2837	2864
Pump S Pressure(psi)	364	367	366	366	364
Pump Control Volt(V)	9.2	9.2	9.2	9.2	9.2
Control Oil Flow(gpm)	3.64	3.71	3.57	3.50	3.59
Brake Lube Flow(gpm)	1.06	1.10	1.02	0.98	1.04
Ambient (oF)	72	73	73	73	73
Temp into F.D. (oF)			165		
Temp inside F.D.(oF)			205		

	17:45:03	17:50:00	17:55:02	18:00:00	18:05:03
FD Output Power (hp)	-33	-34	-30	-27	-36
Output Torque(lb-ft)	-470	-486	-430	-387	-509
FD Output Speed(rpm)	367	366	367	366	367
FD Input Speed (rpm)	1642	1642	1642	1645	1644
Pump Speed (rpm)	2098	2099	2100	2099	2102
Lo Rnge Clutch (psi)	7	7	7	7	7
Hi Rnge Clutch (psi)	231	230	233	233	231
Pump P Pressure(psi)	2858	2849	2847	2849	2855
Pump S Pressure(psi)	368	368	367	366	365
Pump Control Volt(V)	9.2	9.2	9.2	9.2	9.2
Control Oil Flow(gpm)	3.57	3.52	3.60	3.60	3.52
Brake Lube Flow(gpm)	1.02	0.99	1.04	1.05	1.01
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					165
Temp inside F.D.(oF)					203

	18:10:01	18:15:05	18:20:05	18:25:00	18:30:01
FD Output Power (hp)	-27	-33	-33	-28	-29
Output Torque(lb-ft)	-390	-465	-471	-401	-413
FD Output Speed(rpm)	367	367	367	367	367
FD Input Speed (rpm)	1644	1643	1647	1646	1646
Pump Speed (rpm)	2102	2101	2102	2101	2101
Lo Rnge Clutch (psi)	7	7	7	7	7
Hi Rnge Clutch (psi)	234	238	230	230	228
Pump P Pressure(psi)	2852	2842	2813	2818	2819
Pump S Pressure(psi)	366	366	363	363	367
Pump Control Volt(V)	9.2	9.2	9.2	9.2	9.2
Control Oil Flow(gpm)	3.60	3.77	3.61	3.57	3.51
Brake Lube Flow(gpm)	1.05	1.13	1.06	1.02	0.99
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					163
Temp inside F.D.(oF)					203

Date: 10:22:84

	18:35:01	18:38:16	<del>15:20:01</del>	15:25:01	15:30:03
FD Output Power (hp)	-32	0	<del>61</del>	60	50
Output Torque(lb-ft)	-464	-8	<del>1928</del>	1880	1882
FD Output Speed(rpm)	367	0	<del>167</del>	167	167
FD Input Speed (rpm)	1647	0	<del>1749</del>	1749	1752
Pump Speed (rpm)	2100	0	<del>2080</del>	2081	2083
Lo Range Clutch (psi)	8	8	<del>257</del>	251	250
Hi Range Clutch (psi)	230	0	<del>8</del>	8	8
Pump P Pressure(psi)	2807	-3	<del>443</del>	446	447
Pump S Pressure(psi)	364	-8	<del>2914</del>	2899	2911
Pump Control Volt(V)	9.2	-0.0	<del>10.4</del>	10.4	10.4
Control Oil Flow(gpm)	3.49	0.00	<del>1.52</del>	1.48	1.48
Brake Lube Flow(gpm)	0.98	0.00	<del>1.09</del>	1.07	1.06
Ambient (cF)	73	73	<del>71</del>	71	73
Temp into F.D. (cF)					
Temp inside F.D.(cF)					

Test Engineer: Nadine Barr

Date: 10-23-84

Final Drive S/N 4

Run No. 4

	08:23:36	08:25:00	08:30:04	08:35:02	08:40:02
FD Output Power (hp)	-95	-90	-84	-94	-92
Output Torque(lb-ft)	-4414	-4270	-4112	-4694	-4250
FD Output Speed(rpm)	113	111	108	105	113
FD Input Speed (rpm)	1186	1160	1126	1105	1180
Pump Speed (rpm)	2033	2036	2039	2039	2041
Lo Rnge Clutch (psi)	262	249	270	249	215
Hi Rnge Clutch (psi)	6	7	7	7	7
Pump P Pressure(psi)	5407	5141	4721	5121	4934
Pump S Pressure(psi)	383	376	371	363	356
Pump Control Volt(V)	7.3	7.3	7.3	7.5	8.0
Control Oil Flow(gpm)	0.79	0.84	1.07	1.13	1.07
Brake Lube Flow(gpm)	0.67	0.65	0.90	0.91	0.75
Ambient (oF)	80	80	81	81	78
Temp into F.D. (oF)	140			163	
Temp inside F.D.(oF)	125			174	

	08:45:01	08:50:04	08:55:00	09:00:02	09:05:05
FD Output Power (hp)	-34	-33	-35	-34	-31
Output Torque(lb-ft)	-649	-630	-662	-645	-591
FD Output Speed(rpm)	272	273	275	277	278
FD Input Speed (rpm)	1219	1223	1234	1242	1245
Pump Speed (rpm)	2052	2052	2054	2059	2063
Lo Rnge Clutch (psi)	9	9	9	9	9
Hi Rnge Clutch (psi)	234	229	223	231	231
Pump P Pressure(psi)	2814	2602	2631	2640	2825
Pump S Pressure(psi)	364	365	369	370	369
Pump Control Volt(V)	7.7	7.7	7.7	7.7	7.7
Control Oil Flow(gpm)	3.95	3.98	3.80	3.85	3.89
Brake Lube Flow(gpm)	1.21	1.22	1.13	1.14	1.15
Ambient (oF)	72	71	70	70	69
Temp into F.D. (oF)	172				
Temp inside F.D.(oF)	196				

	09:10:03	09:15:00	09:20:00	09:25:01	09:30:02
FD Output Power (hp)	-33	-33	-63	-62	-65
Output Torque(lb-ft)	-622	-620	-1240	-1246	-1297
FD Output Speed(rpm)	278	278	265	263	262
FD Input Speed (rpm)	1246	1245	1197	1178	1176
Pump Speed (rpm)	2064	2062	2060	2059	2062
Lo Rnge Clutch (psi)	9	9	9	8	8
Hi Rnge Clutch (psi)	225	229	227	233	220
Pump P Pressure(psi)	2807	2838	4145	4080	4035
Pump S Pressure(psi)	366	369	362	364	365
Pump Control Volt(V)	7.7	7.7	7.7	7.7	7.7
Control Oil Flow(gpm)	3.85	3.86	3.76	3.76	3.67
Brake Lube Flow(gpm)	1.16	1.14	1.10	1.15	1.10
Ambient (oF)	69	69	70	70	70
Temp into F.D. (oF)		166		162	
Temp inside F.D.(oF)		206		200	

Date: 10:25:64

	09:35:01	09:40:03	09:45:04	09:50:01	09:55:04
FD Output Power (hp)	-61	-65	-61	-63	-61
Output Torque(lb-ft)	-1211	-1110	-1058	-1092	-1046
FD Output Speed(rpm)	262	305	305	305	305
FD Input Speed (rpm)	1175	1368	1366	1365	1368
Pump Speed (rpm)	2062	2062	2060	2060	2062
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	218	225	227	220	220
Pump P Pressure(psi)	4021	4207	4159	4187	4119
Pump S Pressure(psi)	360	359	363	357	364
Pump Control Volt(V)	7.7	8.8	8.8	8.8	8.8
Control Oil Flow(gpm)	3.57	3.71	3.74	3.65	3.61
Brake Lube Flow(gpm)	1.05	1.11	1.14	1.08	1.08
Ambient (oF)	71	71	71	71	72
Temp into F.D. (oF)	161		166		
Temp inside F.D. (oF)	198		206		

	10:00:01	10:05:04	10:10:05	10:15:00	10:20:01
FD Output Power (hp)	-64	-62	-66	-63	-60
Output Torque(lb-ft)	-1096	-1075	-1223	-1157	-1100
FD Output Speed(rpm)	305	305	284	285	285
FD Input Speed (rpm)	1365	1366	1273	1277	1278
Pump Speed (rpm)	2063	2062	2062	2064	2062
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	226	224	222	219	230
Pump P Pressure(psi)	4160	4115	4120	4057	3971
Pump S Pressure(psi)	356	359	359	360	363
Pump Control Volt(V)	8.8	8.8	8.1	8.1	8.1
Control Oil Flow(gpm)	3.76	3.75	3.69	3.63	3.73
Brake Lube Flow(gpm)	1.16	1.15	1.11	1.07	1.12
Ambient (oF)	71	71	71	71	72
Temp into F.D. (oF)		169			
Temp inside F.D. (oF)		209			

	10:25:04	10:30:01	10:35:02	10:40:03	10:45:05
FD Output Power (hp)	-66	-61	-57	-64	-69
Output Torque(lb-ft)	-1216	-789	-742	-836	-901
FD Output Speed(rpm)	284	409	406	402	400
FD Input Speed (rpm)	1273	1829	1822	1800	1792
Pump Speed (rpm)	2061	2056	2057	2056	2058
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	234	236	240	244	246
Pump P Pressure(psi)	4087	4552	4525	4662	4662
Pump S Pressure(psi)	359	353	360	353	357
Pump Control Volt(V)	8.1	10.8	10.8	10.8	10.9
Control Oil Flow(gpm)	3.86	3.78	3.94	3.93	3.94
Brake Lube Flow(gpm)	1.18	1.15	1.19	1.23	1.25
Ambient (oF)	71	71	71	72	71
Temp into F.D. (oF)	168				172
Temp inside F.D. (oF)	203				221

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	10:50:05	10:55:01	11:00:02	11:05:02	11:10:03
FD Output Power (hp)	-66	-61	-63	-62	-64
Output Torque(lb-ft)	-1454	-1336	-1371	-1338	-1383
FD Output Speed(rpm)	238	242	243	244	244
FD Input Speed (rpm)	1066	1081	1088	1094	1093
Pump Speed (rpm)	2062	2063	2063	2062	2066
Lo Rnge Clutch (psi)	8	8	8	8	3
Hi Rnge Clutch (psi)	230	227	227	234	226
Pump P Pressure(psi)	4097	3947	4057	3980	4000
Pump S Pressure(psi)	357	353	358	362	359
Pump Control Volt(V)	7.1	7.1	7.1	7.1	7.1
Control Oil Flow(gpm)	3.62	3.48	3.41	3.54	3.40
Brake Lube Flow(gpm)	1.01	0.92	0.88	0.95	0.88
Ambient (oF)	72	71	71	71	71
Temp into F.D. (oF)				163	
Temp inside F.D.(oF)				188	

	11:15:02	11:20:04	11:25:01	11:30:03	11:33:43
FD Output Power (hp)	-59	-63	-65	-64	0
Output Torque(lb-ft)	-1267	-1357	-1392	-1381	39
FD Output Speed(rpm)	245	243	244	244	0
FD Input Speed (rpm)	1097	1089	1093	1095	0
Pump Speed (rpm)	2065	2063	2063	2063	87
Lo Rnge Clutch (psi)	8	8	8	8	3
Hi Rnge Clutch (psi)	230	236	237	230	1
Pump P Pressure(psi)	3973	4119	4072	3995	-4
Pump S Pressure(psi)	360	362	362	358	-8
Pump Control Volt(V)	7.1	7.1	7.1	7.1	-0.0
Control Oil Flow(gpm)	3.44	3.55	3.57	3.42	0.00
Brake Lube Flow(gpm)	0.89	0.95	0.96	0.89	0.00
Ambient (oF)	70	71	71	71	71
Temp into F.D. (oF)				158	
Temp inside F.D.(oF)				185	

# Two-Speed Final Drive

Test Engineer: Nadine Barr

Date: 18/23/84

Final Drive S/N 4

Run No. 5

	13:02:56	13:05:00	13:10:00	13:15:01	13:20:03
FD Output Power (hp)	-103	-59	-65	-91	-91
Output Torque(lb-ft)	-1101	-581	-682	-1679	-1692
FD Output Speed (rpm)	492	535	505	283	285
FD Input Speed (rpm)	2207	*2387	*2253	1271	1268
Pump Speed (rpm)	2038	2045	2050	2050	2052
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	232	196	215	210	216
Pump P Pressure(psi)	6261	5663	5157	5346	5305
Pump S Pressure(psi)	370	352	352	348	355
Pump Control Volt(V)	11.2	11.7	11.7	8.2	3.2
Control Oil Flow(gpm)	3.22	3.14	3.46	3.32	3.26
Brake Lube Flow(gpm)	0.79	0.79	0.93	0.85	0.80
Ambient (oF)	71	72	71	73	78
Temp into F.D. (oF)		170	174	165	158
Temp inside F.D. (oF)		226	234	205	198

	13:25:00	13:30:03	13:35:00	13:40:03	13:45:00
FD Output Power (hp)	-92	-90	-87	-88	-92
Output Torque(lb-ft)	-1715	-1672	-1615	-1632	-1768
FD Output Speed (rpm)	282	282	283	283	273
FD Input Speed (rpm)	1262	1264	1268	1267	1244
Pump Speed (rpm)	2053	2055	2056	2059	2058
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	224	225	225	229	234
Pump P Pressure(psi)	5294	5182	5145	5198	5322
Pump S Pressure(psi)	353	354	354	353	352
Pump Control Volt(V)	8.2	8.2	8.2	8.2	8.2
Control Oil Flow(gpm)	3.47	3.61	3.51	3.44	3.50
Brake Lube Flow(gpm)	0.91	0.93	0.90	0.85	0.89
Ambient (oF)	75	73	72	72	72
Temp into F.D. (oF)					
Temp inside F.D. (oF)					

	13:50:04	13:55:03	14:00:05	14:05:02	14:10:02
FD Output Power (hp)	-97	-94	-22	-18	-21
Output Torque(lb-ft)	-1841	-1786	-369	-300	-339
FD Output Speed (rpm)	277	277	316	323	327
FD Input Speed (rpm)	1243	1241	1414	1452	1465
Pump Speed (rpm)	2061	2062	2079	2081	2083
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	235	233	227	221	233
Pump P Pressure(psi)	5489	5474	2160	2238	2276
Pump S Pressure(psi)	356	350	362	365	367
Pump Control Volt(V)	8.2	8.2	8.2	8.2	8.2
Control Oil Flow(gpm)	3.58	3.59	3.47	3.39	3.49
Brake Lube Flow(gpm)	0.93	0.94	0.89	0.86	0.89
Ambient (oF)	72	73	73	72	72
Temp into F.D. (oF)		168			161
Temp inside F.D. (oF)		199	4-87		198

Date:10:23:84

	14:15:02	14:20:04	14:25:02	14:30:01	14:35:04
FD Output Power (hp)	-22	-19	-21	-20	-32
Output Torque(lb-ft)	-350	-303	-330	-317	-352
FD Output Speed (rpm)	328	329	330	330	421
FD Input Speed (rpm)	1469	1477	1479	1480	2147
Pump Speed (rpm)	2079	2082	2083	2083	2072
Lo Rnge Clutch (psi)	8	9	8	8	8
Hi Rnge Clutch (psi)	234	229	238	241	230
Pump P Pressure(psi)	2286	2280	2324	2322	4662
Pump S Pressure(psi)	367	365	370	373	361
Pump Control Volt(V)	8.2	8.2	8.2	8.2	11.2
Control Oil Flow(gpm)	3.54	3.48	3.52	3.63	3.53
Brake Lube Flow(gpm)	0.90	0.90	0.89	0.95	0.92
Ambient (oF)	72	72	72	72	73
Temp into F.D. (oF)			161	168	169
Temp inside F.D.(oF)			198	202	225

	14:40:00	14:45:04	14:50:00	14:55:02	15:00:04
FD Output Power (hp)	-54	-61	-63	-40	-41
Output Torque(lb-ft)	-595	-688	-716	-449	-450
FD Output Speed (rpm)	473	465	461	473	479
FD Input Speed (rpm)	2126	2092	2059	2111	2144
Pump Speed (rpm)	2072	2075	2076	2085	2087
Lo Rnge Clutch (psi)	8	9	8	8	8
Hi Rnge Clutch (psi)	229	229	221	234	236
Pump P Pressure(psi)	4494	4575	4661	3668	3761
Pump S Pressure(psi)	352	355	352	354	358
Pump Control Volt(V)	11.2	11.2	11.2	11.2	11.2
Control Oil Flow(gpm)	3.37	3.26	3.37	3.50	3.76
Brake Lube Flow(gpm)	0.83	0.76	0.86	0.90	1.16
Ambient (oF)	74	73	73	73	73
Temp into F.D. (oF)	157		164	167	167
Temp inside F.D.(oF)	222		220	226	226

	15:05:04	15:10:03	15:15:00	15:20:02	15:25:00
FD Output Power (hp)	-41	-42	-21	-22	-22
Output Torque(lb-ft)	-451	-454	-350	-357	-355
FD Output Speed (rpm)	481	484	322	325	327
FD Input Speed (rpm)	2156	2165	1438	1455	1466
Pump Speed (rpm)	2085	2085	2097	2098	2098
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	237	237	236	237	238
Pump P Pressure(psi)	3843	3859	2105	2217	2240
Pump S Pressure(psi)	357	361	366	365	364
Pump Control Volt(V)	11.2	11.2	8.1	8.1	8.1
Control Oil Flow(gpm)	3.71	3.73	3.72	3.68	3.72
Brake Lube Flow(gpm)	1.08	1.10	1.10	1.07	1.09
Ambient (oF)	73	73	73	74	75
Temp into F.D. (oF)	164	165	163		
Temp inside F.D.(oF)	230	230	206		



Date: 10/25/84

	15:30:05	15:35:03	15:40:05	15:45:00	15:50:01
FD Output Power (hp)	-22	-22	-22	-22	-22
Output Torque(lb-ft)	-355	-358	-358	-360	-357
FD Output Speed (rpm)	326	326	326	325	326
FD Input Speed (rpm)	1463	1461	1459	1457	1460
Pump Speed (rpm)	2099	2100	2095	2097	2097
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	236	235	234	237	236
Pump P Pressure(psi)	2258	2258	2262	2283	2261
Pump S Pressure(psi)	366	366	367	364	366
Pump Control Volt(V)	8.1	8.1	8.1	8.1	8.1
Control Oil Flow(gpm)	3.65	3.64	3.56	3.67	3.70
Brake Lube Flow(gpm)	1.05	1.05	0.99	1.01	1.07
Ambient (oF)	75	75	75	75	75
Temp into F.D. (oF)					162
Temp inside F.D. (oF)					198

	15:55:00	16:00:04	16:05:00	16:10:03	16:15:01
FD Output Power (hp)	-22	-23	-28	-28	-28
Output Torque(lb-ft)	-358	-362	-390	-382	-386
FD Output Speed (rpm)	326	327	382	382	382
FD Input Speed (rpm)	1461	1462	1714	1712	1712
Pump Speed (rpm)	2098	2099	2099	2100	2101
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	235	236	239	232	235
Pump P Pressure(psi)	2260	2291	2741	2712	2705
Pump S Pressure(psi)	366	367	365	367	365
Pump Control Volt(V)	8.1	8.1	9.5	9.5	9.5
Control Oil Flow(gpm)	3.64	3.65	3.72	3.59	3.73
Brake Lube Flow(gpm)	1.04	1.05	1.10	1.03	1.11
Ambient (oF)	75	75	75	75	75
Temp into F.D. (oF)					
Temp inside F.D. (oF)					

Test Engineer: Nadine Barr  
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	16:20:01	16:25:04	16:30:05	16:35:00	16:40:01
FD Output Power (hp)	-28	-28	-23	-28	-23
Output Torque(lb-ft)	-384	-381	-383	-381	-361
FD Output Speed(rpm)	383	383	383	383	339
FD Input Speed (rpm)	1713	1715	1712	1716	1518
Pump Speed (rpm)	2101	2102	2103	2103	2105
Lo Rnge Clutch (psi)	8	9	8	8	3
Hi Rnge Clutch (psi)	236	233	233	233	234
Pump P Pressure(psi)	2677	2693	2700	2700	2330
Pump S Pressure(psi)	368	365	363	362	365
Pump Control Volt(V)	9.5	9.5	9.5	9.5	8.4
Control Oil Flow(gpm)	3.77	3.66	3.63	3.60	3.70
Brake Lube Flow(gpm)	1.13	1.08	1.05	1.03	1.07
Ambient (oF)	75	75	75	75	74
Temp into F.D. (oF)	162			160	
Temp inside F.D.(oF)	198			204	

	16:45:00	16:50:01	16:55:04	17:00:00	17:05:00
FD Output Power (hp)	-23	-24	-23	-24	-120
Output Torque(lb-ft)	-361	-365	-361	-366	-2233
FD Output Speed(rpm)	340	340	341	342	282
FD Input Speed (rpm)	1522	1527	1529	1529	1263
Pump Speed (rpm)	2105	2105	2106	2108	2089
Lo Rnge Clutch (psi)	8	9	8	8	8
Hi Rnge Clutch (psi)	236	233	232	236	230
Pump P Pressure(psi)	2337	2338	2349	2368	6552
Pump S Pressure(psi)	366	365	366	367	351
Pump Control Volt(V)	8.4	8.4	8.4	8.4	8.4
Control Oil Flow(gpm)	3.74	3.70	3.66	3.74	3.57
Brake Lube Flow(gpm)	1.12	1.09	1.05	1.12	1.01
Ambient (oF)	74	74	73	74	73
Temp into F.D. (oF)		161		167	156
Temp inside F.D.(oF)		201		202	195

	17:10:02	17:15:04	17:20:00	17:25:03	17:30:05
FD Output Power (hp)	-124	-122	14	16	17
Output Torque(lb-ft)	-2474	-2454	276	296	306
FD Output Speed(rpm)	264	260	265	279	286
FD Input Speed (rpm)	1182	1166	1187	1246	1292
Pump Speed (rpm)	2088	2089	2114	2113	2115
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	229	232	233	242	231
Pump P Pressure(psi)	6770	6637	439	444	448
Pump S Pressure(psi)	341	340	1503	1600	1604
Pump Control Volt(V)	8.4	8.4	7.8	7.8	7.8
Control Oil Flow(gpm)	3.45	3.39	3.44	3.82	3.94
Brake Lube Flow(gpm)	0.94	0.91	0.95	1.17	1.27
Ambient (oF)	73	73	74	74	75
Temp into F.D. (oF)		148			
Temp inside F.D.(oF)		184			

Date: 10/25/84

	17:35:02	17:40:04	17:45:05	17:50:01	17:55:03
FD Output Power (hp)	21	21	21	21	21
Output Torque(lb-ft)	324	326	326	321	322
FD Output Speed(rpm)	334	335	337	338	338
FD Input Speed (rpm)	1498	1504	1507	1513	1513
Pump Speed (rpm)	2112	2116	2115	2115	2115
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	246	245	240	239	237
Pump P Pressure(psi)	437	446	446	449	448
Pump S Pressure(psi)	1871	1896	1904	1898	1911
Pump Control Volt(V)	8.9	8.9	8.9	8.9	8.9
Control Oil Flow(gpm)	4.10	3.73	3.88	3.84	3.76
Brake Lube Flow(gpm)	1.33	1.08	1.18	1.18	1.12
Ambient (oF)	75	75	74	74	74
Temp into F.D. (oF)			175		
Temp inside F.D.(oF)			204		

	18:00:01	18:05:06	18:10:00	18:15:01	18:20:02
FD Output Power (hp)	21	20	21	20	21
Output Torque(lb-ft)	322	319	322	318	320
FD Output Speed(rpm)	337	337	338	338	337
FD Input Speed (rpm)	1516	1510	1513	1512	1510
Pump Speed (rpm)	2113	2114	2116	2114	2115
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	219	223	225	227	235
Pump P Pressure(psi)	444	449	446	446	447
Pump S Pressure(psi)	1900	1922	1911	1916	1896
Pump Control Volt(V)	8.9	8.9	8.9	8.9	8.9
Control Oil Flow(gpm)	3.51	3.53	3.57	3.55	3.66
Brake Lube Flow(gpm)	1.01	1.01	1.04	1.01	1.08
Ambient (oF)	74	74	74	74	74
Temp into F.D. (oF)	167			160	
Temp inside F.D.(oF)	204			199	

	18:25:01	18:30:04	18:32:22	15:20:02	15:25:00
FD Output Power (hp)	20	20	0	-22	-22
Output Torque(lb-ft)	316	310	-24	-357	-355
FD Output Speed(rpm)	337	337	0	325	327
FD Input Speed (rpm)	1510	1511	0	1455	1466
Pump Speed (rpm)	2113	2115	49	2098	2098
Lo Rnge Clutch (psi)	8	8	2	8	8
Hi Rnge Clutch (psi)	231	228	0	237	238
Pump P Pressure(psi)	445	448	21	2217	2240
Pump S Pressure(psi)	1941	1911	13	1665	1664
Pump Control Volt(V)	8.9	8.9	-0.0	8.1	8.1
Control Oil Flow(gpm)	3.65	3.54	0.00	3.68	3.72
Brake Lube Flow(gpm)	1.06	1.01	0.00	1.07	1.08
Ambient (oF)	75	75	75	74	75
Temp into F.D. (oF)		160			
Temp inside F.D.(oF)		199			

Test Engineer: Nadine Barr  
 Date: 10-24-84  
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	08:24:12	08:25:00	08:30:01	08:37:17	08:40:01
FD Output Power (hp)	42	62	30	71	63
Output Torque(lb-ft)	471	706	1018	1607	1407
FD Output Speed(rpm)	465	464	156	231	253
FD Input Speed (rpm)	2072	2078	677	1034	1045
Pump Speed (rpm)	2037	2035	2029	2042	2047
Lo Rnge Clutch (psi)	10	9	9	8	9
Hi Rnge Clutch (psi)	232	218	243	200	223
Pump P Pressure(psi)	461	464	307	413	439
Pump S Pressure(psi)	3855	4586	5984	3617	3262
Pump Control Volt(V)	10.1	10.5	13.7	7.6	7.6
Control Oil Flow(gpm)	3.11	2.72	3.46	2.76	3.09
Brake Lube Flow(gpm)	0.92	0.51	0.98	0.56	0.68
Ambient (oF)	76	77	76	72	71
Temp into F.D. (oF)				143	
Temp inside F.D. (oF)				160	

	08:45:06	08:50:03	08:55:01	09:00:03	09:05:06
FD Output Power (hp)	60	62	60	65	64
Output Torque(lb-ft)	1331	1365	1324	851	787
FD Output Speed(rpm)	236	238	240	403	425
FD Input Speed (rpm)	1056	1066	1076	1805	1906
Pump Speed (rpm)	2043	2041	2042	2041	2045
Lo Rnge Clutch (psi)	9	8	8	9	8
Hi Rnge Clutch (psi)	240	237	240	223	227
Pump P Pressure(psi)	441	437	436	420	431
Pump S Pressure(psi)	3172	3238	3192	3792	3779
Pump Control Volt(V)	7.6	7.6	7.6	11.3	11.3
Control Oil Flow(gpm)	3.28	3.29	3.36	3.32	3.47
Brake Lube Flow(gpm)	0.77	0.78	0.82	0.62	0.91
Ambient (oF)	76	78	73	72	72
Temp into F.D. (oF)			153		166
Temp inside F.D. (oF)			170		206

	09:10:03	09:15:01	09:20:01	09:25:01	09:30:01
FD Output Power (hp)	62	64	63	63	62
Output Torque(lb-ft)	751	762	745	737	723
FD Output Speed(rpm)	434	440	410	446	447
FD Input Speed (rpm)	1944	1973	1982	2001	2007
Pump Speed (rpm)	2045	2044	2041	2044	2044
Lo Rnge Clutch (psi)	8	8	9	9	9
Hi Rnge Clutch (psi)	228	233	237	237	239
Pump P Pressure(psi)	437	432	434	430	430
Pump S Pressure(psi)	3783	3842	3880	3849	3831
Pump Control Volt(V)	11.3	11.3	11.3	11.3	11.3
Control Oil Flow(gpm)	3.51	3.43	3.47	3.44	3.50
Brake Lube Flow(gpm)	0.93	0.85	0.87	0.85	0.89
Ambient (oF)	78	77	74	73	72
Temp into F.D. (oF)		160			161
Temp inside F.D. (oF)		211			213

Date:10:24:34

	09:35:05	09:40:02	09:45:03	09:50:05	09:55:01
FD Output Power (hp)	61	62	60	59	62
Output Torque(lb-ft)	625	641	624	615	643
FD Output Speed(rpm)	510	507	507	507	502
FD Input Speed (rpm)	*2284	*2271	*2271	*2271	*2249
Pump Speed (rpm)	2043	2044	2043	2044	2042
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	205	206	212	212	229
Pump P Pressure(psi)	428	429	431	423	430
Pump S Pressure(psi)	4024	4059	3984	3941	4067
Pump Control Volt(V)	12.2	12.2	12.2	12.2	12.2
Control Oil Flow(gpm)	3.22	3.17	3.29	3.32	3.44
Brake Lube Flow(gpm)	0.80	0.76	0.81	0.83	0.86
Ambient (oF)	72	72	76	73	75
Temp into F.D. (oF)		160		163	
Temp inside F.D.(oF)		215		221	

	10:00:04	10:05:01	10:10:01	10:15:01	10:20:00
FD Output Power (hp)	62	62	63	63	62
Output Torque(lb-ft)	649	649	656	656	649
FD Output Speed(rpm)	502	503	501	501	502
FD Input Speed (rpm)	*2249	*2249	*2249	*2249	2903
Pump Speed (rpm)	2045	2046	2044	2047	2046
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	231	231	234	232	235
Pump P Pressure(psi)	434	431	429	424	427
Pump S Pressure(psi)	4064	4032	4068	4078	4055
Pump Control Volt(V)	12.2	12.2	12.2	12.2	12.2
Control Oil Flow(gpm)	3.52	3.44	3.52	3.49	3.48
Brake Lube Flow(gpm)	0.91	0.85	0.90	0.89	0.87
Ambient (oF)	74	73	73	73	73
Temp into F.D. (oF)	165			160	
Temp inside F.D.(oF)	223			221	

	10:25:05	10:30:00	10:35:05	13:03:22	13:05:00
FD Output Power (hp)	0	0	0	12	23
Output Torque(lb-ft)	-13	-12	-11	302	371
FD Output Speed(rpm)	0	0	0	213	321
FD Input Speed (rpm)	0	0	0	955	1438
Pump Speed (rpm)	0	0	0	2531	2529
Lo Rnge Clutch (psi)	3	1	1	9	9
Hi Rnge Clutch (psi)	0	0	0	230	236
Pump P Pressure(psi)	-8	-8	-10	482	479
Pump S Pressure(psi)	-3	-4	-3	1542	2044
Pump Control Volt(V)	0.0	0.0	0.0	6.1	7.2
Control Oil Flow(gpm)	0.00	0.00	0.00	2.01	2.16
Brake Lube Flow(gpm)	0.00	0.00	0.00	0.22	0.27
Ambient (oF)	73	72	71	70	70
Temp into F.D. (oF)				104	114
Temp inside F.D.(oF)				128	153

\* Input Speed Calculated

Date:10:24:84

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	13:10:04	13:15:01	13:20:02	13:25:03	13:30:00
FD Output Power (hp)	69	20	94	88	93
Output Torque(lb-ft)	554	319	1652	1609	1762
FD Output Speed(rpm)	656	321	257	288	278
FD Input Speed (rpm)	2941	1436	1331	1292	1247
Pump Speed (rpm)	2516	2529	2520	2522	2522
Lo Rnge Clutch (psi)	9	8	8	8	8
Hi Rnge Clutch (psi)	244	243	239	238	238
Pump P Pressure(psi)	460	468	462	457	444
Pump S Pressure(psi)	4857	1672	3960	3746	3927
Pump Control Volt(V)	11.7	6.9	6.9	6.9	6.9
Control Oil Flow(gpm)	3.12	3.33	3.25	3.16	3.15
Brake Lube Flow(gpm)	0.85	0.83	0.74	0.67	0.66
Ambient (oF)	71	71	72	72	72
Temp into F.D. (oF)			160		
Temp inside F.D. (oF)			196		

	13:35:05	13:40:03	13:45:06	13:50:02	13:55:04
FD Output Power (hp)	86	96	92	93	91
Output Torque(lb-ft)	1685	1874	1830	1852	1784
FD Output Speed(rpm)	270	270	265	266	267
FD Input Speed (rpm)	1207	1207	1190	1193	1194
Pump Speed (rpm)	2525	2528	2529	2535	2534
Lo Rnge Clutch (psi)	3	8	3	8	8
Hi Rnge Clutch (psi)	237	236	237	238	239
Pump P Pressure(psi)	448	458	455	449	447
Pump S Pressure(psi)	4066	3893	4064	3980	3954
Pump Control Volt(V)	6.9	6.9	6.9	6.9	6.9
Control Oil Flow(gpm)	3.25	3.22	3.28	3.36	3.42
Brake Lube Flow(gpm)	0.77	0.75	0.79	0.84	0.87
Ambient (oF)	72	72	73	73	73
Temp into F.D. (oF)	152				161
Temp inside F.D. (oF)	188				191

Test Engineer: Nadine Barr  
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	14:00:01	14:05:04	14:10:05	14:15:05	14:20:00
FD Output Power (hp)	91	31	93	93	92
Output Torque(lb-ft)	1800	1793	1840	1825	1809
FD Output Speed(rpm)	266	267	267	267	268
FD Input Speed (rpm)	1192	1196	1195	1197	1199
Pump Speed (rpm)	2536	2539	2545	2544	2547
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	238	239	238	236	236
Pump P Pressure(psi)	443	454	448	444	456
Pump S Pressure(psi)	3986	3935	4026	3908	3943
Pump Control Volt(V)	6.9	6.9	6.9	6.9	6.9
Control Oil Flow(gpm)	3.34	3.38	3.33	3.25	3.21
Brake Lube Flow(gpm)	0.82	0.85	0.81	0.76	0.74
Ambient (oF)	73	73	73	73	73
Temp into F.D. (oF)					150
Temp inside F.D.(oF)					184

	14:25:05	14:30:05	14:35:00	14:40:00	14:45:03
FD Output Power (hp)	92	124	120	123	122
Output Torque(lb-ft)	1813	2581	2559	2676	2671
FD Output Speed(rpm)	266	252	246	241	240
FD Input Speed (rpm)	1189	1127	1105	1078	1073
Pump Speed (rpm)	2539	2534	2538	2536	2541
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	238	237	238	241	236
Pump P Pressure(psi)	456	437	432	431	431
Pump S Pressure(psi)	3995	5147	5040	5153	5133
Pump Control Volt(V)	6.9	6.9	6.9	6.9	6.9
Control Oil Flow(gpm)	3.30	3.33	3.39	3.62	3.52
Brake Lube Flow(gpm)	0.80	0.82	0.85	0.99	0.93
Ambient (oF)	73	73	73	73	74
Temp into F.D. (oF)	157			176	
Temp inside F.D.(oF)	188			200	

	14:50:01	14:55:05	15:00:05	15:05:03	15:10:01
FD Output Power (hp)	122	122	121	129	124
Output Torque(lb-ft)	2625	2690	2668	2903	2758
FD Output Speed(rpm)	239	238	238	233	236
FD Input Speed (rpm)	1069	1067	1065	1043	1056
Pump Speed (rpm)	2543	2543	2543	2543	2545
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	234	234	233	236	235
Pump P Pressure(psi)	432	424	430	421	420
Pump S Pressure(psi)	5154	5170	5129	5440	5223
Pump Control Volt(V)	6.9	6.9	6.9	6.9	6.9
Control Oil Flow(gpm)	3.38	3.29	3.34	3.40	3.44
Brake Lube Flow(gpm)	0.85	0.78	0.82	0.86	0.88
Ambient (oF)	73	73	73	74	74
Temp into F.D. (oF)		154			165
Temp inside F.D.(oF)		187			192

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	15:15:05	15:20:01	15:25:02	15:30:05	15:35:01
FD Output Power (hp)	18	28	28	28	28
Output Torque(lb-ft)	330	382	321	378	376
FD Output Speed(rpm)	279	385	391	394	394
FD Input Speed (rpm)	1251	1725	1749	1762	1766
Pump Speed (rpm)	2569	2562	2564	2564	2565
Lo Rnge Clutch (psi)	8	8	8	8	8
Hi Rnge Clutch (psi)	234	235	236	236	236
Pump P Pressure(psi)	456	453	454	455	454
Pump S Pressure(psi)	1529	1993	1996	1992	1996
Pump Control Volt(V)	6.9	8.1	8.1	8.1	8.1
Control Oil Flow(gpm)	3.41	3.40	3.53	3.49	3.48
Brake Lube Flow(gpm)	0.85	0.85	0.93	0.91	0.90
Ambient (oF)	74	74	73	73	73
Temp into F.D. (oF)					167
Temp inside F.D. (oF)					214



Test Engineer: Nadine Barr  
 Date: 10:25:84  
 Final Drive S/N 4  
 Run No. 7

	09:14:58	09:15:09	09:20:05	09:25:01	09:30:02
FD Output Power (hp)	-19	-23	-120	-124	-117
Output Torque(lb-ft)	-751	-891	-5563	-6158	-6037
FD Output Speed(rpm)	136	135	114	106	102
FD Input Speed (rpm)	1423	1416	1191	1110	1066
Pump Speed (rpm)	2170	2171	2145	2140	2146
Lo Rnge Clutch (psi)	250	249	245	233	239
Hi Rnge Clutch (psi)	7	7	7	7	8
Pump P Pressure(psi)	1890	1978	6119	6311	6158
Pump S Pressure(psi)	385	391	367	358	357
Pump Control Volt(V)	7.4	7.4	7.4	7.4	7.4
Control Oil Flow(gpm)	0.86	0.86	0.89	1.23	1.34
Brake Lube Flow(gpm)	0.62	0.62	0.62	0.90	0.97
Ambient (oF)	72	72	72	72	73
Temp into F.D. (oF)			149	157	166
Temp inside F.D. (oF)			153	171	184

	09:35:03	11:03:15	11:03:03	11:02:56	10:55:05
FD Output Power (hp)	-121	0	0	0	-34
Output Torque(lb-ft)	-5897	27	-27	-27	-633
FD Output Speed(rpm)	108	0	0	0	284
FD Input Speed (rpm)	1132	0	0	0	1273
Pump Speed (rpm)	2144	2184	2187	2153	2073
Lo Rnge Clutch (psi)	251	11	11	10	-1023
Hi Rnge Clutch (psi)	8	232	232	232	230
Pump P Pressure(psi)	6003	487	484	487	2545
Pump S Pressure(psi)	352	401	401	400	366
Pump Control Volt(V)	7.8	-0.0	-0.0	-0.0	7.8
Control Oil Flow(gpm)	1.30	3.43	3.43	3.44	3.13
Brake Lube Flow(gpm)	0.91	0.73	0.73	0.73	0.69
Ambient (oF)	72	73	73	73	73
Temp into F.D. (oF)	167				
Temp inside F.D. (oF)	193				

Appendix 5

Oil Sample Reports

FINAL DRIVE

S/N 1

**FMC Corporation**

Central Engineering Laboratories  
1185 Coleman Avenue Box 580  
Santa Clara California 95052  
(408) 289-2731

**MATERIALS ENGINEERING LABORATORY  
TEST REPORT****FMC**

<u>Target Date</u>	<u>Responsibility</u>	<u>WP No.</u>	<u>Charge No.</u>	<u>Lab No.</u>
	6 GBR	964	5H7376928	843941

REQUESTOR: N.Barr  
DIV/CO NAME: ODE  
STREET: M/D 750  
CITY/STATE/ZIP: SJ  
TELEPHONE: 5918

Requestor Date: 8 October 1984  
Rec'd Date: 9 October 1984

cc: R. Kazares/CEL-SJ

SUBJECT/PART NAME: Lubricant Samples

**SUPPLEMENTARY INFO:**

REC NO:  
SPECIFICATION: Not identified.

NO.TEST PCS: 5

BACKGROUND: Two speed final drive - S/N 001, Dyno

INFORMATION DESIRED: Foreign Contaminate + Particle Size.

**SUMMARY OF RESULTS**

22 October 1984

Analytical results of the filtered contaminants, and particle size distribution data are shown in Tables I and II.

**SAMPLE IDENTIFICATION**

- #1 - S/N 001, Dyno, 10/1/84, 0 Hours
- #2 - S/N 001, Dyno, 10/2/84, 5 Hours
- #3 - 2-SP FD, Dyno, 10/2/84, 10 Hours
- #4 - 2-SP FD, Dyno, 10/3/84, 15 Hours
- #5 - S/N 001, Dyno, 10/5/84, 20 Hours

*Beryl Rogers*  
Beryl Rogers  
lea

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L/N 843941

**FMC**

**TABLE I**  
**CONTAMINANT, QUANTITY AND ANALYSIS**

	Sample Number				
	1	2	3	4	5
Total Particulate per 100 ml of Fluid, mg	46.0	114.4	72.8	81.2	84.4
Elemental Analysis (% by Weight)					
Lead	<.087	.175	.076	2.69	<.047
Zinc	.417	.336	.462	.47	.455
Copper	.061	.035	.044	.039	.047
Manganese	.009	.003	.005	.005	.005
Chromium	.009	.006	.010	.005	.009
Cadmium	.035	.014	.021	.025	.019
Nickel	.043	.014	.033	.020	.029
Iron	1.17	.755	1.08	.931	1.36
Silver	<.009	<.003	<.005	<.005	<.005
Aluminum	.383	.241	.418	.365	.474
Silica	7.3	2.4	4.4	5.4	3.3

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**TABLE II**  
**PARTICLE SIZE DISTRIBUTION**

Particle Size (Microns)	Number/100 mls (1)				
	#1	#2	#3	#4	#5
5-11	5,121,954	4,801,187	3,463,987	4,879,645	7,642,569
11-25	121,421	168,550	146,885	86,758	199,947
25-50	14,132	22,364	18,165	1,500	17,565
50-100	1,400	167	33	0	567
100-150	100	100	45	0	55
Greater Than 150	33	0	0	0	22

(1) Average of 2 runs.

Analysts: A. Berta *AB*  
N. Nachnani *NN*

FINAL DRIVE

S/N 2

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**MATERIALS ENGINEERING LABORATORY  
TEST REPORT****FMC**

<u>Target Date</u>	<u>Responsibility</u>	<u>WP No.</u>	<u>Charge No.</u>	<u>Lab No.</u>
	6 GBR	587	5H7375828	843798

REQUESTOR:	N.Barr	Requestor Date:	28 September 1984
DIV/CO NAME:	ODE	Rec'd Date:	28 September 1984
STREET:	M/D 750		
CITY/STATE/ZIP:	SJ	cc:	R. Kazares/CEL-SJ
TELEPHONE:	2725		

SUBJECT/PART NAME: Lubricant Samples

SUPPLEMENTARY INFO:

PART NO:		SIZE:
MFGR:	FMC	HEAT NO:
BATCH NO:		LOT SIZE:
LOT NO:		P.O. NO:
REC NO:		NO. TEST PCS:
SPECIFICATION:	MIL-L-2104, Grade 30	

BACKGROUND: Two-Speed Final Drive lube and control pressure oil

INFORMATION DESIRED: Particulate size and foreign contaminant. Check the viscosity at room temperature.

SUMMARY OF RESULTS

8 October 1984

S/N 002

Particle size distribution data, and analytical results of the 0.8 micron filtered lubricant contaminants are shown in the attached table.

*Beryl Rogers*

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lea

*6/10/85*



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L/N 843798  
Addendum A, 1/9/85



**ADDENDUM A**

Due to an error in sample identification, CEL L/N 843798 is rearranged in this addendum to reflect the chronological test sampling order per the requestor's instructions. The sample identification numbers have been reassigned.

<u>Sample ID #</u>	<u>Hours of Operation</u>	<u>Time &amp; Date</u>
1	0	13:15 - 9/10/84
2	5	14:00 - 9/12/84
3	10	--- 9/18/84
4	15	--- 9/20/84
5	20	--- 9/27/84

A handwritten signature in cursive script, appearing to read "Alan T. Berta".

Alan T. Berta

*Be*

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L/N 843798

Addendum A, 1/9/85

**FMC**

TABLE I

**TOTAL PARTICULATE AND ELEMENTAL ANALYSIS**

	Sample ID #				
	1	2	3	4	5
Total Particulate (mg/100 mL Sample)	71	49	39	49	47
Elemental Analysis (ppm)					
Lead	<1.1	<1.1	1.1	<1.1	<1.1
Zinc*	2.57	2.46	2.01	1.90	2.35
Copper	0.45	0.56	0.45	0.34	0.45
Manganese	<0.1	0.11	0.11	0.11	0.11
Chromium	0.11	0.11	0.11	0.11	0.22
Cadmium	0.22	<0.1	0.11	0.22	0.11
Nickel	0.67	0.67	0.89	0.67	1.01
Iron	5.37	5.59	6.49	5.48	5.48
Aluminum	1.68	0.56	1.79	1.57	1.68
Silver	<0.1	<0.1	<0.1	<0.1	<0.1
Silica (as SiO <sub>2</sub> )	28	24	36	44	28

\* Part of the zinc content is the metallo-organic additive in the original lubricant.

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L/N 843798

Addendum A, 1/9/85

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**TABLE II**  
**PARTICLE SIZE AND DISTRIBUTION**

Sample ID #	Number of Particles/100 mL Sample*				
	1	2	3	4	5
Particle Size Range (microns)					
5-11	3,612,500	3,240,000	4,275,000	6,587,000	2,918,800
11-25	72,840	36,660	261,160	59,600	57,120
25-50	25,280	17,700	84,440	20,240	11,320
50-100	6,000	2,240	15,120	4,200	1,520
100-150	280	220	280	160	240
>150	0	40	240	0	0

\* Average of four or more runs.

**TABLE III**  
**VISCOSITY AT ROOM TEMPERATURE (68°F)\***

Sample ID #	1	2	3	4	5
Viscosity (cSt)	321.6	336.1	377.5	312.6	332.8

\* Specific Gravity at 68°F is 0.894gm/cc. This value is used for all samples in calculating the viscosity in centistokes.

FINAL DRIVE

S/N 3

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**MATERIALS ENGINEERING LABORATORY  
TEST REPORT****FMC**

<u>Target Date</u>	<u>Responsibility</u>	<u>WP No.</u>	<u>Charge No.</u>	<u>Lab No.</u>
	6 GBR	325	5H7378828	844092

REQUESTOR:	N. Barr	Requestor Date:	19 October 1984
DIV/CO NAME:	ODE	Rec'd Date:	19 October 1984
STREET:	M/D-750		
CITY/STATE/ZIP:		cc:	R. Kazares/CEL-SJ
TELEPHONE:	2725		

SUBJECT/PART NAME: Lubricants

SUPPLEMENTARY INFO:

PART NO:	SIZE:
MFGR:	HEAT NO:
BATCH NO:	LOT SIZE:
LOT NO:	P.O. NO:
REC NO:	NO. TEST PCS: 6
SPECIFICATION:	

BACKGROUND:

INFORMATION DESIRED: Two Speed Final Drive S/N 003. Particle size distribution and contaminants. Viscosity at room temperature and specific gravity at R.7..

SUMMARY OF RESULTS

30 October 1984

Test results of the six lubricant samples from the two-speed final drive, S/N 003, are shown in the attached tables.

*Beryl Rogers*  
Beryl Rogers

csj

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L/N 844092



**TABLE I**  
**CONTAMINANT ANALYSIS<sup>1</sup>**

**Sample Identification**

1. S/N 003, 2-Speed Final Drive Dyno, 10/9/84, 0 hours
2. " " " " " 10/9/84, 5 hours
3. " " " " " 10/12/84, 10 hours
4. " " " " " 10/13/84, 15 hours
5. " " " " " 10/17/84, 17 hours
6. " " " " " 10/18/84, 20 hours

	SAMPLE NUMBER					
	1	2	3	4	5	6
Total Particulate Per 100 mL of Fluid, mg	76	75	71	84	77	66
Elemental Analysis % by Weight:						
Lead	<.13	<.13	<.14	<.12	0.21	0.24
Zinc	.45	.64	.54	.44	.44	.52
Copper	.08	.08	.10	.06	.07	.09
Manganese	.03	.04	.04	.04	.03	.03
Chromium	.01	.01	.01	.01	.01	.02
Cadmium	.01	.01	.01	.01	.01	.03
Nickel	.05	.05	.04	.04	.03	.06
Iron	1.79	2.76	2.30	1.63	1.82	2.29
Silver	<.01	<.01	<.01	<.01	<.01	<.01
Aluminum	.47	.49	.52	.43	.52	.70
Silica	6.58	8.0	9.86	4.76	7.04	7.58

<sup>1</sup> Contaminants filtered through 0.8 micron millipore disk. Atomic absorption analysis, percent by weight of total residue.

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L/N 844092

**FMC****TABLE II****ROOM TEMPERATURE PROPERTIES (68°F)<sup>1</sup>**

<u>Sample Number</u>	<u>Viscosity Centistokes</u>	<u>Specific Gravity g/cc</u>
1	425.2	.888
2	435.4	.888
3	431.0	.887
4	437.1	.886
5	428.1	.886
6	430.7	.886

**PARTICLE SIZE DISTRIBUTION<sup>2</sup>**

Number per 100 mL\*

Particle (Microns)	SAMPLE NUMBER					
	1	2	3	4	5	6
5-11	8,236,910	9,500,050	9,289,738	8,837,649	8,967,570	9,117,422
11-25	416,092	600,740	633,470	640,003	593,474	580,275
25-50	47,129	46,062	46,395	63,660	78,525	58,727
50-100	800	1,067	800	400	333	333
100-150	45	111	23	0	45	0
Greater Than 150	0	22	22	0	22	0

Analysts: A. Berta  
N. Nachnani

\*Average of 3 runs.

1 Viscosity determined on Brookfield LVT viscometer calibrated to sub-size quantity due to limited sample size.

2 Particle size distribution computed from 10 mL sample, counted in Hiac-Royal particle counter.

FINAL DRIVE

S/N 4



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**MATERIALS ENGINEERING LABORATORY  
TEST REPORT****FMC**

<u>Target Date</u>	<u>Responsibility</u>	<u>WP No.</u>	<u>Charge No.</u>	<u>Lab No.</u>
	6 GBR	654	5H7380428	844256

REQUESTOR:	N. Barr	Requestor Date:	31 October 1984
DIV/CO NAME:	ODE	Rec'd Date:	31 October 1984
STREET:	M/D 750		
CITY/STATE/ZIP:	SJ	cc:	R. Kazares/CEL
TELEPHONE:	5918		

SUBJECT/PART NAME: Lubricant Samples

SUPPLEMENTARY INFO:

REC NO: NO. TEST PCS: 6  
SPECIFICATION:

BACKGROUND: 2-Speed Final Drive, S/N 004.

INFORMATION DESIRED: Particulate and Element Analysis, Particle Size  
Distribution, Viscosity @ Room Temperature and Specific  
Gravity.

SUMMARY OF RESULTS

28 November 1984

Test results of the six (6) lubricant samples submitted from S/N 004 are shown in Tables I, IIA and IIB.

**SAMPLE IDENTIFICATION**S/N 004, Dyno

- #1 - 10/19/84 - 0 Hours
- #2 - 10/22/84 - 5 Hours
- #3 - 10/23/84 - 10 Hours
- #4 - 10/23/84 - 15 Hours
- #5 - 10/25/84 - 20 Hours
- #6 - 10/30/84 - After Shifts

*Beryl Rogers*  
Beryl Rogers  
lea

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L/N 844256



**TABLE I**  
**CONTAMINANT ANALYSIS <sup>1</sup>**

	Sample Number					
	1	2	3	4	5	4
Total Particulate per 100 mL of fluid (mg)	55.2	23.6	102	98.8	30.4	47.6
Elemental Analysis (% By Weight)						
Lead	<.007	<.2	<.04	<.04	<.13	<.08
Zinc	.61	1.02	.337	.336	.71	.53
Copper	.072	.119	.027	.020	.066	.076
Manganese	.029	.051	.011	.012	.039	.034
Chromium	.022	.051	.011	.012	.039	.034
Cadmium	.022	.051	.011	.012	.026	.025
Nickel	.036	.051	.011	.012	.039	.059
Iron	2.59	4.53	1.01	.814	2.82	3.09
Silver	<.007	<.02	<.004	<.004	<.013	<.008
Aluminum	.48	.73	.17	.18	.59	.50
Silica	5.56	2.78	4.35	2.22	3.15	5.04

<sup>1</sup> = Contaminants filtered through 0.8 micron millipore. Analysis by atomic absorption, percent of total residue.

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L/N 844256

**FMC****TABLE IIA****ROOM TEMPERATURE PROPERTIES (70°F) <sup>1</sup>**

Sample Number	Viscosity (Centistokes)	Specific Gravity (g/cc)
1	388.2	.880
2	406.7	.880
3	385.5	.880
4	399	.878
5	379.6	.878
6	412	.880

**TABLE IIB****PARTICLE SIZE DISTRIBUTION <sup>2</sup>**

Particle Size (Microns)	Number per 100 mLs * Sample Number					
	1	2	3	4	5	6
5-11	8,168,583	6,227,444	5,493,517	4,591,874	4,821,584	7,558,311
11-25	412,892	193,914	95,724	16,265	171,116	521,881
25-50	31,664	9,866	8,399	3,000	13,332	43,062
50-100	1,200	1,467	1,400	667	1,667	1,067
100-150	45	22	33	22	45	22
Greater Than 150	0	0	0	0	0	0

1 = Viscosity determined with Brookfield LVT viscometer calibrated to sub-size quantity due to limited sample size.

2 = Particle size distribution computed from 10 mL sample. Analyzed by Hiac-Royal particle counter.

\* = Average of 3 runs.

Analysts: A. Berta *A. Berta*  
N. Nachnani *Nee/a Nachnani*